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RECREATIONS

IN

AGRICULTURE, NATURAL-HISTORY,

ARTS,

AND

MISCELLANEOUS LITERATURE.

BY

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JAMES ANDERSON, LIND.

THE AUTHOR.

THESE RECREATIONS, which have been the subject of a long and successful career, are now published in a new and improved edition, with many additions and alterations, and a new preface. The author has been enabled to collect a large number of new facts and observations, which he has incorporated into the work, and has also revised the whole with great care and attention. The work is now published in a new and improved edition, with many additions and alterations, and a new preface. The author has been enabled to collect a large number of new facts and observations, which he has incorporated into the work, and has also revised the whole with great care and attention.

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Nº 1. VOL. III.

AGRICULTURE.

Hints respecting the circumstances that require to be chiefly adverted to in experimental agriculture, particularly with a view to a proposal for instituting a national experimental farm.

[Continued from Vol. II. page 329.]

ON THE VARIETIES OF THE BOS TRIBE OF
ANIMALS, COMMONLY CALLED CATTLE.

THE varieties of this species are, perhaps, more numerous than any of the domestic animals that have been hitherto reared for profit by the farmer; and are also distinguished from each other by more striking peculiarities: but, as may naturally be expected from the difficulty in transporting such a large sized animal

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from a distance, the nature of many of these varieties is but very little known to the British farmer. The naturalist has hitherto rather directed his attention towards the discrimination of external appearances in living objects that may assist him in the mere classification, than in observing the economical uses to which they could be applied; so that it is only from mere hints which may be incidentally picked up in a devious course of reading, that any clue can be found for directing our pursuits in this respect. Nor do we meet with that accuracy that could be wished for on this head, even in the mere act of classification itself; for, although several strongly marked varieties have been enumerated that are very easily distinguishable from each other by obvious peculiarities, such as the Buffalo, Bison, Zebu, &c. yet it is by no means ascertained, whether they are only varieties strictly so called, or whether some of them may not be distinct species. Leaving this as a point to be yet settled, I shall for the present consider them all under one head, as all the varieties are in a lesser or a greater degree capable of being serviceable to man as beasts of burden, or as furnishing food to him by their milk and carcase, and of affording materials for manufactures by their tallow, fur, and hides; and it is fit that he should know with certainty the comparative profit which he could derive from each of these in regard to all these particulars, if he ever wishes to know which of them it will be most his interest to rear. I shall therefore, with a view to avoid embarrassment on the subject, arrange what I have to say upon it under different heads: and,

1st. *On the varieties of cattle, considered as to the external coating of hair, fur, or wool.*

We in Britain are, indeed, so little acquainted with some of those varieties that have never fallen under our own inspection, that it is with some diffidence I shall venture to mention certain peculiarities of these that have been incidentally discovered, lest it should excite some degree of ridicule. But ridicule of this sort is usually the attendant of ignorance alone. We may suppose that a native of Otaheite, who had by chance heard of or seen a horse, would have been laughed at as a being beyond measure credulous, who could seriously assert that an animal any where existed which had the powers and other well known qualities of the horse, in many respects so much superior to any of the animals he had ever seen; yet we know that such ridicule would have been highly displaced. If we were to set bounds to possibilities merely by the standard of our own knowledge alone, Would it not have been natural for the inhabitants of Madagascar to believe that though sheep were known throughout the greatest part of the globe, yet that this class of animals, like the horse and the cow, afforded every where only a short coat of stiff hair that in no respect resembled the closer fur of the cat and many other fur-bearing animals. But if we know that this conclusion of his would have been erroneous, how shall we be able to free ourselves from the imputation of a prejudice equally blind and presumptuous, should we pretend to say, that because the cattle *we* have usu-

On the Varieties of Cattle.

ally reared in this country produce in general a kind of short hard hair, this must be deemed a never-failing characteristic of the whole species; and that the man lied who should pretend to say that a variety of cattle might possibly exist, though unknown to us, which, like the sheep, equally unknown to the inhabitants of Madagascar, may carry a close fleece of long hair or wool that may prove highly beneficial for the purposes of human life? Experience ought long ago to have taught us to be extremely cautious how we pretend to set bounds to the power of the almighty Creator of the universe, who, though he hath endowed man with powers capable of rendering himself the temporary lord of this globe, hath given him that distinguished privilege merely by endowing him alone with the faculty of observing facts as they fall under his view, of comparing them together, and of drawing from these deductions that may prove beneficial to himself. It seems to have been the will of Heaven that man should be more powerfully guarded from falling into the error specified above in regard to the particular which at present claims our attention, than most others; for it will be found; that among the animals which fall most immediately under his observation, the canine species in particular, who are his constant companions through life in every situation on the globe, in no peculiarity do the varieties differ more from each other than in regard to his native kind of clothing, which varies in every possible degree from the closest fur, or wool, to the shortest stiff hair. The sheep and the goat, the animals which he could next most easily subdue and bring into a state of domestic submission, we have

just seen exhibit a like diversity in this respect. Where then are we to seek for that law in nature which should determine that the *bos* tribe should be a singular exception to an experience which, in as far as we have yet gone, should point at something like an universal rule? I cannot find it; and hence I conclude, that there is nothing so absurd in the idea that a variety of this class of animals may be found which affords a valuable fleece or fur that may be useful to man, as to make us despise every hint that may point towards the discovery of such an animal. For if man hath derived greater profit from rearing the fur-bearing breeds of sheep than the naked, why shall we suppose that he would not perhaps be equally benefited by a fur-bearing race of cattle, if such should ever be discovered and generally reared by him?

These arguments are adduced chiefly with a view to guard against that propensity which the mind so naturally feels to reject as suspicious any idea on practical subjects to which it has not been familiarised from its infancy, and to awaken a spirit of unprejudiced inquiry on a very interesting subject, that has been, from accidental circumstances, too long repressed. The benefits that Britain has already derived from the introduction of foreign articles, both of the vegetable and the animal kingdom, are inestimable, and should stimulate us to farther exertions of a similar kind. Not to dwell upon the herbs, fruits, and flowers, cultivated in our gardens, most of which are of foreign origin, many of them from very distant regions; nor of the corns sown on our fields, not one of which was probably a native of this country, the

potatoe alone, which was introduced into common culture almost in our own day, is an acquisition which would have been cheaply purchased at any price. Among the animal tribes too, the poultry which stock our yards every where, and form the greatest delicacies of our table, are wholly of foreign origin. The horse also, now so peculiarly our own as to obtain the name emphatically of English, is known to have been imported into this island: nor have we reason to believe that the sheep, whose fleece in its raw or manufactured state, has long been the pride of this nation, can be called originally our own. The importation of small animals from distant regions is a matter of little difficulty when compared with those of a larger size, so that fewer opportunities have been given of bringing their respective merits to a comparative trial; and, of course, prejudices have taken deeper root with regard to them, and erroneous judgments may be more difficult to eradicate. This will leave scope to improvements in future ages, of which we cannot now have a just idea; our business is, to prepare the way for others, as our predecessors have done for us; and to add as we go along, the little that falls within our reach, to the sum total of human knowledge.

In respect to covering, hair, fur, or wool, perhaps as great a diversity takes place among the different varieties of the bos tribe as among any of those already enumerated. The shortest and the closest hair I ever observed on any animal of so large a size was that of one of the varieties belonging to the division called *Zebu*. The hair did not exceed half an inch in length, but it was so close set in the skin as rather

to resemble a brush than any thing else, only that the hairs, though stiff to a considerable degree, were yet soft to the feel, and being placed obliquely were very smooth to the touch when stroaked with the grain, resembling in this respect a seal's skin, but the hair was more than twice as thick. As the garden Teazel, which possesses a quality somewhat of a similar kind, has been found to be of very great utility when employed as a tool in the manufacture of cloth, it seems to be by no means impossible but that this skin in its native state might be employed very beneficially for some purposes in life, were it properly adverted to. If firmly stretched upon a piece of wood, there seems good reason to believe that it would form a very cheap kind of brush that might be of great use for many purposes in life, particularly for smoothing hats, and other things of a similar kind; and a few strokes with it against the grain would operate powerfully in raising the particles of dust in cloth without tearing the filaments asunder, the pile of which might then be delicately smoothed by reversing that operation. This animal was a native of the East Indies, and affords one of the numerous examples of the futility of that rule which has been too often implicitly relied upon as infallible; viz. that hot climates produce thin and coarse hair. It was one of the most gentle and docile creatures of the *bos* tribe that I have ever seen; of very considerable size, and great bodily strength. It had been imported from India by a gentleman in Yorkshire. This was a bull, who, having had progeny in Britain both by his own breed and by the native cows of this country, was growing old, and had

been sold to a man who led him through the country as a show. His skin handled kindly, being soft, though firm; and he had all the habits and propensities of our common breed, in as far as I could observe; but was much more placid in his look, and more gentle than the common bull.

Of the cattle in this country, the short-horned Dutch or Holdernefs breed have also very short and smooth hair, though it is very thinly set upon the body. The Lancashire long-horned breed have longer and softer hair, gently waved. Some breeds of Highland cattle have hair still longer, softer, and closer than these: I have seen a variety of the Highland breed with a mane which became pretty long towards the head, with a tuft between the horns that sometimes nearly covered the eyes, which gave it a very fierce look and savage appearance. I have also seen another variety of Highland cattle, whose hair was of a pale lead colour, most beautiful to look at, and which was always soft and glossy as silk. I have seen these in several different places; but every where the pile of the coat of this breed of cattle exhibited the same glossy silky appearance wherever its native colour appeared undebased by an admixture with any other breed.

The Bison of Louisiana, commonly called the American Buffalo, carries a fleece still closer, longer, and softer than that of any of the varieties known in this country: nor is it sleek and waved, like the long hair already noticed, but is burly and close at the points, more nearly resembling the fur of other animals, or the wool of sheep, than other kinds of hair. This

has been often shorn or plucked from the skin, and worked up into stockings and other useful fabrics as wool; but, more usually, the hide is dressed with the fur on it, and is kept as a wrapper for travellers, which, though weighty, is so extremely warm as to be much in use by all the persons who travel through the internal parts of America in winter, and well answers the purpose of blankets among the woods in those desert regions. This variety of buffalo is an animal of great size, and ranges in vast herds in the large fertile plains on the banks of the Mississippi, where it often attains to such an unwieldly state of fatness, as to be unable to escape from the hunters, who slaughter them in great numbers merely for the sake of their tallow, tongues, and hides, leaving the carcass as a prey to wolves and other ravenous animals. Of its other qualities, particularly that of yielding milk, we are not as yet informed; as few attempts have hitherto been made to domesticate them, though this appears to be a task that may be accomplished with the greatest ease, by means of a natural instinct that seems to be in some measure peculiar to this animal; for when a female who has a young calf at her foot is killed, the calf, like the young elephant, and some other animals, will not desert her dam; nor does it attack her murderer, as the young elephant is said to do, but stands quietly by till the butcher has cut up the cow into quarters, and then follows whithersoever he chooses to conduct it. The reader will find this extraordinary fact stated more circumstantially than I have now done, in a letter from Mr. Turnbull to Mr. Mathews, in the eighth volume of the Correspondence of the Society at Bath, who farther states,

that when trained up in a domestic way, it is extremely docile; and so strong, when employed in draught, as to exceed, he says, two oxen of the common breeds of this country. These notices sufficiently point out this animal as a proper object for farther elucidation.

There is another variety of the *los* tribe remarkable for its length of hair: it is found in the higher parts of India under the name of the *Chittigong* cow, and is supposed to be merely the *Sarluc*, or grunting ox of Thibet domesticated. With its distinctive qualities we are too little acquainted to be able to speak with confidence. All that is certain is, that, being a native of a cold climate, we have no reason to think it would not thrive here; and, being domesticated for profit, the probability is that it possesses some valuable peculiarities. It is said to be covered all over with a coat of very long hair that hangs down below its knees. It is uniformly black all over, except the mane and tail, and a ridge down the back, which are white. The hairs of the tail are very beautiful, and are much prized over all India for fly flaps; for which purpose they are mostly fitted to silver handles. In China, the hairs of the mane are dyed of a red colour, with which the natives form an ornamental tuft on the crown of their bonnets, so that it forms a beneficial article of traffic with that country. With the peculiarities of the rest of the fleece I am entirely unacquainted. This also is an article which evidently requires to be more fully investigated, and I shall esteem it a particular kindness if any of the readers of this work in India will favour me with whatever authentic intelligence they can pick up respecting this,

or any of the other varieties of cattle, or other domesticated animals that may come within the reach of their cognisance.

“The *Yak* of *Tartary* (as described by Lieutenant Samuel Turner in the fourth volume of the *Asiatic Researches*) called *Soora-goy* in Hindostan, and which I term [we give this description in Mr. Turner’s own words] the *bushy-tailed bull of Tibet*, is about the height of an English bull, which he resembles in the figure of the body, head, and legs. I could distinguish between them no essential difference, except only that the *Yak* is covered all over with a thick coat of long hair. The head is rather short, crowned with two smooth round horns, that, tapering from the setting on, terminate in sharp points, arch inwardly, and near the extremities are a little turned back; the ears are small; the forehead appears prominent, being adorned with much curling hair; the eyes are full and large; the nose smooth and convex; the nostrils small; the neck short, describing a curvature nearly equal both above and below; the withers high and arched; the rump low. Over the shoulders rises a bunch, which at first sight would seem to be the same kind of exuberance peculiar to the cattle of Hindostan; but in reality it consists in the superior length of the hair only, which, as well as that along the ridge of the back to the setting on of the tail, grows long and erect, but not harsh. The tail is composed of a prodigious quantity of long flowing glossy hair descending to the hock, and is so extremely well furnished, that not a joint of it is perceptible; but it has much the appearance of a large bunch of hair artificially set on. The shoulders, rump, and upper part of the body,

are clothed with a sort of *thick soft wool*, but the inferior parts with straight pendent hair that descends below the knee; and I have seen it so long in some cattle which were in high health and condition as to trail along the ground. From the chest, between the fore-legs, issues a large pointed tuft of hair, growing somewhat longer than the rest. The legs are very short. In every other respect, hoofs, &c. he resembles the ordinary bull. There is a great variety of colours among them, but black or white are the most prevalent. It is not uncommon to see the long hair upon the ridge of the back, the tail, tuft upon the chest, and the legs below the knee, white, when all the rest of the animal is jet black.

“These cattle, though not large boned, from the profuse quantity of hair with which they are provided, appear of great bulk. They have a down heavy look, but are fierce, and discover much impatience at the near approach of strangers. They do not low loud (like the cattle of England) any more than those of Hindostan; but make a low grunting noise scarcely audible, and that but seldom, when under some impression of uneasiness. These cattle are pastured in the coldest parts of Tibet upon short herbage peculiar to the tops of mountains and bleak plains. That chain of lofty mountains situated between lat. 27 and 28, which divide *Tibet* from *Bootan*, and whose summits are most commonly clothed with snow, is their favourite haunt. In this vicinity the southern glens afford them food and shelter during the severity of the winter; in milder seasons the northern aspect is more congenial to their nature, and admits a wider range. They are a very valuable property to the tribes of illi-

terate Tartars, who live in tents and tend them from place to place, affording their herdsmen a mode of conveyance, a good covering, and subsistence. They are never employed in agriculture, but are extremely useful as beasts of burden; for they are strong, sure-footed, and carry a great weight. Tents and ropes are manufactured of their hair; and I have seen, though amongst the humblest ranks of herdsmen, caps and jackets worn of their skins. Their tails are esteemed throughout the East, as far as luxury or parade have any influence on the manners of the people; and on the continent of India are found, under the denomination of *Chowries*, in the hands of the meanest grooms, as well as occasionally in those of the first ministers of state. Yet the best requital with which the care of their keepers is at length rewarded for selecting them good pastures, is in the *abundant quantity of rich milk* they give, yielding most excellent butter, which they have a custom of depositing in skins, or bladders, and excluding the air: it keeps in this cold climate all the year, so that after some time tending their flocks, when a sufficient stock is accumulated, it remains only to load their cattle, and drive them to a proper market with their own produce, which constitutes, to the utmost verge of Tartary, a most material article of commerce.”

I have inserted the above article at full length, as it contains information that must be deemed important by every person who is curious in useful researches. Whether it be the same with the Chittigong cow, of which I have had imperfect notices from other quarters, or the *Sarluc*, or grunting ox, of which also I have received some obscure notices, with both which

the above account in some measure accords, so as to render this extremely probable, or if they are distinct from each other, my information does not at present authorise me to decide. But there can be no doubt that this is a breed of cattle (if it can be strictly admitted into that class) that is extremely different from any in Europe. It is a domestic animal at least, possessing many valuable qualities, and which it behoves us much to have its comparative merits fairly ascertained. It were greatly to be wished then that a breed of this cattle could be transmitted to England for that purpose. The state of my own finances cannot admit of me attempting to obtain the live animal myself; but I will take it as a singular favour, if some of my readers in India will favour me with correct elucidations on this head: and, if they can find it convenient, to accompany these with correct drawings of these or any other useful objects, it will be deemed a most acceptable present; for it appears to me that the drawing of the Yak which accompanies the above account must be incorrect (especially about the head), for which reason I have declined to copy it at present. It is so difficult to preserve dried skins with the hair on in such a long voyage, that I cannot presume to solicit that such should be sent. I may beg leave to add, that any packet for this miscellany will be properly forwarded if addressed to the care of Messrs. Colvins and Bazett, Calcutta; or Dr. Anderson, Madras.

Of the musk ox of Hudson's Bay I can speak with greater certainty, as I have often conversed with a gentleman who had lived twenty years in that country, and who had seen, perhaps, some thousands of

these animals, dead and alive. In its stature it does not attain the size of an ordinary English ox; and in its form it so nearly resembles a sheep, that were it not for the horns, which are short, and of a very particular conformation, which I need not here describe, it might naturally be taken for a sheep in preference to any other known class of animals. The body is every where covered with a thick and deep coat of hair, the roots of which are imbedded in a close fur or wool, remarkably fine, and soft and silky. The hair is so long as nearly to trail upon the ground as the creature walks. The wool of this animal is so soft and fine, that Mr. Graham, my informant, caused some of it to be spun and wrought into gloves and stockings, which were warm and soft as fur, and lustrous like silk. They were so much coveted, that they had been all given away as presents before I had the pleasure of his acquaintance. A French gentleman, whose name I have now forgotten, presented to the Royal Academy at Paris, several years ago, some stockings and gloves that were made of the same material, which in softness, fineness, and lustre, were said to rival silk; so that there seems to be no room to doubt that it is of a very *fine* quality; and I was informed that the *quantity* is very considerable. The tail is covered with a particular kind of hair, of which the Esquimaux make great use in their manufactures, some of which are worked with a most amazing degree of delicacy. As to the other peculiarities of this creature, they are very little known. It is gregarious and active, going in great flocks together for a vast extent along those northern regions; and its flesh forms a principal article of subsistence to the inha-

bitants of Hudson's Bay, both natives and Europeans. If they be killed during the rutting season, the flesh is strongly tainted with a musky flavour, from whence it has obtained its name. This taint is not perceptible if it be killed at any other time, provided the heart be taken out immediately; but if that member be left long in the body after death, it then also becomes tainted; otherwise the flesh is very pleasant. No attempt has hitherto been made to domesticate this creature; but there seems little reason to doubt, that were the calves caught when very young, or cut out of the cows that were shot while very near the calving time, and carefully put to a domestic cow, they might be easily tamed under a cautious mode of management.

The bases of the bull's horns spread over the upper part of the head, and cover it with a flat horny substance of considerable breadth, which, when separated from the head, is hollow on the inside, and of a form approaching to a square. This, when separated from the horn, forms a very convenient dish, that is universally employed by the native Esquimaux for many domestic purposes. Unless it be in regard to this particular, and the nature of its dung, which drops from the animal in the form of little hardish balls resembling that of sheep, it is said to differ in no respect from other animals of the bos tribe. From these facts then it appears very obvious, that there are several breeds of cattle which afford very abundant fleeces of wool or hair that might be applied to many useful purposes of life, in which we have hitherto been accustomed to employ the fleeces of sheep only; and, as the value of the fleeces of these wool-bearing breeds

of cattle would make a very great addition to the profit of rearing these kinds of cattle, if the carcase should be found to be of equal value with that of the smooth-haired cattle that we have been in the use of rearing in Europe, it becomes a matter of great national consequence to have the other qualities of these breeds of cattle ascertained with the most accurate precision. For this purpose, it is much to be wished that some effectual means might be taken to obtain a pure breed of each of these kinds of cattle in this country; and when they are arrived, to put them into such a situation as that their comparative merits respectively in regard to quickness of fattening, delicacy of flavour, hardiness, and all other qualities, should be fairly ascertained by a set of judicious and well-devised experiments, conducted with the most faithful accuracy and precision. Until that shall be done, we are clearly guilty of a very culpable degree of negligence, for which no proper apology can ever be made.

[*To be continued.*]



The Musk Cow and Bull of Hudson's Bay.

NATURAL HISTORY.

On the transformations and other peculiarities of the Ephemera fly.

THE life of an insect is in general of short duration; but that of the *Ephemera* in its fly state is the most fleeting of any that hath hitherto attracted the notice of man. It is generally supposed, that it lives only for the space of one day; but the species whose history we mean at present to illustrate cannot lay claim to this protracted longevity, two hours being in general the whole time that is allotted for it to enjoy the blessings of life in this state. Though myriads of them are produced every year in certain places in Europe, there is, perhaps, scarcely one of these that ever sees the light of the sun. They are all born (if we may so speak) after sunset, during the short nights in summer, and long before the dawn of day the whole race has ceased to live; so that were it not for their dead bodies, which may be seen in the morning in abundance in the places they frequent, a person might inhabit those countries for a long life-time without ever knowing that such a creature existed.

But, though its existence in its *fly state* be so very evanescent, it lives in its *larva state* longer than most of the insects that are known to us. Swammerdam, who was a very attentive observer of nature, found one species which did not attain its full size, and go through its whole transformations in less than three years; and Reaumur has ascertained, that the kind of which we now treat, exists fully two years before it reaches that period of its perfection which admits of

its continuing its kind; so that the steps by which it reaches maturity are slow, though its decline after it attains to that state is remarkably rapid.

Nor are the changes that it undergoes in other respects much less surprising to one who is only acquainted with the larger animated objects that surround us, than those above stated. That being which, in its perfect state, is an inhabitant of the air alone, and is deprived of life the moment it is immersed in water, could subsist in that element only while it was in a state of gradual increment: during its long state of non-age, then, it is an aquatic insect, participating more of the nature of a fish than any other animal; nor does it ever leave the water till the moment when it obtains its wings; after which period it eats no more, nor seems to have any other object of pursuit than that of laying the foundation of a progeny to succeed it.

The ephemera, like most insects, proceeds from an egg, which, having been dropped in the water by the fly as it skims along its surface, falls to the bottom, where after a short time it is hatched, and produces a small worm of a taper shape, much resembling that of a fish, only that it has six legs, and a head of an insect form. The kind, whose history we trace in this memoir, though it is doomed to live in water, seems to derive the principal part of its nutriment from earth. No sooner is it called into life, than it makes its way towards the banks of the river in which it finds itself placed; and in the clay or soft earth that it there finds it makes for itself a hole, not burrowing like a rabbit merely for the sake of shelter, but feeding

upon the materials it displaces; like the ship-worm in timber, the book-worm in paper, and the *pholas* in the hard rock, it gradually forms a cavity in which it finds shelter as well as sustenance. After this manner it works its way forward, enlarging the dimensions of its hole as it increases in size, till, having penetrated to a considerable depth in the bank, usually in a position horizontal, it then turns short round, and eats its way back again towards the water, working out this second hole in a direction nearly parallel to the former; so that when you examine the banks of the rivers where this insect abounds, you find them every where perforated with holes of this kind, which for the most part are circular and placed two and two, contiguous to each other; but, as the distance between these holes is very small, and as the earth is loose, it frequently happens, that the division between them is broken down, and the hole in that case assumes an oval form. Mr. Reaumur conjectures that this insect subsists chiefly on earth (like the earth-worm, and many other aquatic animals which cannot subsist without mud), from the appearance of its intestines, which are very plainly perceptible within it by reason of the transparency of its body and its excrements, which seem to be always of the nature of that earth in which it is lodged, nearly in the same manner as the excrements of the larva of the woollen moth (*Tinea*), which are always of the colour of the substance, whether wool, hair, or feathers, that it feeds on at the time.

To convey to the reader some idea of the nature of the changes which this insect undergoes, he is referred to the plate; in which A represents the larva

in its first or vermicular state considerably magnified. It retains this shape, according to Reaumur, from its first appearance in life for the space of about twenty-one months, and in this shape it acquires its full increment of growth. B represents the same insect in its nymph state, which it retains for the space of about three months, during which period it is nearly as active as in its former state, and takes in food the whole time, though it neither increases in size nor varies materially from its former shape; in which respects it differs greatly from those classes of insects that assume the form of a chrysalis (Vol. II. page 361); and Z represents it in its perfect, or *imago* state. In its larva state the most striking peculiarities are *a a* the antennæ, *c c* two strong crooked horny claws, which it can move like forceps, and with which it digs out the earth. Its mouth is below, and thus concealed from this point of view. *i i* the eyes, *g g*, *k k*, *l l*, its three pairs of legs. *d d*, *s s*, the body covered with a particular set of members, which will be noticed soon. *f e f* three remarkable filamentous projections forming the tail. The variations that take place between these two different states of the same insect are so perceptible to the eye that glances at the two figures, as not to require to be indicated by words, farther than barely to remark, that the part *m m* on the upper part of the body B indicates the cover under which the wings of the embryo fly lie concealed until it throws off this its last case, and assumes its imago form.

The whole body consists of nine rings, which are here concealed by a series of flexible membranes *o o s s*, folded over each other in some measure like the gills of fishes, and are like them perpetually agitated

with a very brisk motion; and this peculiarity serves well to discriminate the ephemera from every other class of insects. For, although these members appear under many different forms in the different varieties; in one species, for instance, these spring out from each side one between every pair of rings like so many pairs of oars, and on others they rise up from the body like thin filamentous fins of fishes; yet under every variety of form the same unceasing motion is observable. These, it is conjectured, serve for the purpose of the inspiration and expiration of air. The tail likewise, which consists of three ribs, from the sides of which spring out many smaller feather-like filaments, each of which, when examined by a microscope, is found to contain two hollow tubes, is also conceived to be of use for distributing the same fluid through the body, for some necessary purpose in the economy of this animal.

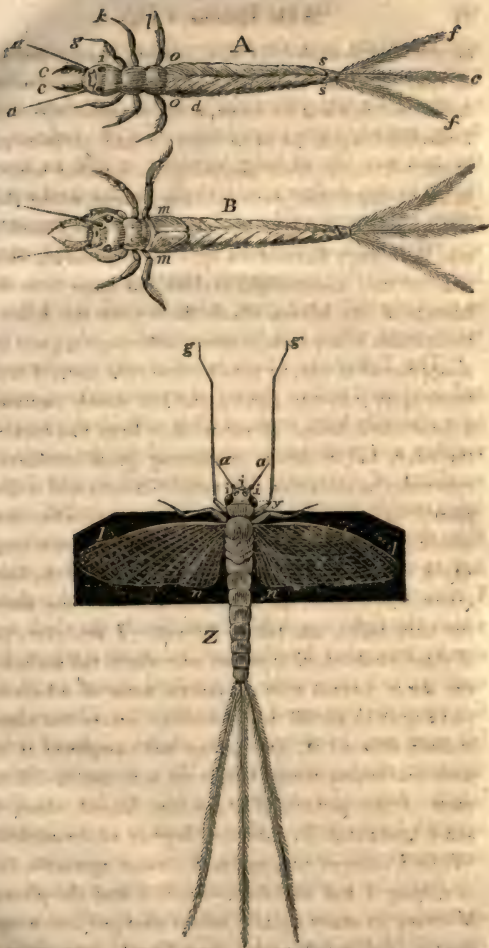
When the time of its last metamorphosis is arrived, and it is about to emerge for ever from the water in which it has till now subsisted, and assume its station in the air, it puts off the whole of this casing, and then assumes the form it bears at Z, in which the rings of its body are plainly perceptible. Its head now assumes a form considerably different from that which it formerly bore. The strong forceps are now entirely dropped. In their place we find two delicate antennæ *a a*, two large netted eyes *y y*, and three other smooth eyes *i i i*, placed in a triangular form. The two fore legs *g g* now stretch forward on each side of the head to a great distance. The other legs are shorter, and serve occasionally to support the body. From its corcelet spread out four semitransparent

wings of a whitish colour, being of a middle nature between those of flies and butterflies, wanting the pure transparency of the one, as well as the downy scales of the other. A strong rib runs along the fore part of each upper wing *l l* from the corcelet towards the extremity, from which other lesser ribs diverge, spreading over the whole wing, and bearing some resemblance to the feathers of some birds, as may be more distinctly recognised by inspecting the figure. The under wings *n n* are small, and, joining closely with the others, seem to form one undivided whole upon a slight inspection.

Having thus given the reader a general idea of the form and transformations of this singular insect, it is proper that I should make him acquainted with some of the principal phenomena that occur respecting it during the short but busy period of its existence in the fly state. To Mr. Reaumur we are indebted for the animated detail he has given of it, a detail which cannot surely be deemed superfluous, when the reader shall be told, that though this philosophical investigator had lived in Paris for the greatest part of his life, it was not until the year 1738, when he was then far past his prime, that he seems to have known that such a thing could ever be seen there; and I think it is not at all improbable, that many millions of persons both before and since that time may have inhabited that metropolis for many years, without having either seen or heard of it.

“It was now,” says he, “the time when they had made me expect that I should see millions of ephemera come out of the river, and rise aloft into the air. The sun was now ready to set, having sunk entirely

beneath the horizon. I saw, indeed, then a few flies of that sort here and there above the surface of the river; but this was far short of the promised spectacle. I remained upon the *Seine* even till half an hour past seven o'clock, without observing the number sensibly to augment; I then went into the *Marne*, where there were still fewer. In short, the night was closed in, and lightnings foretold an approaching storm, which induced me, about eight o'clock, to enter into that branch of the *Marne* which flows past the stairs at the bottom of my own garden. Although a good deal disappointed at having seen so few ephemera, I made them carry into the garden the tub which contained a great many lumps of earth taken from the banks of the river, full of holes, containing great numbers of ephemera in their nymph state. Scarcely had it been placed on one of the steps of the stair, when those who had charge of it, cried out, "What a vast quantity of ephemera are here!" I seized one of the lights which they carried before me to show the way during the dark night, and ran to the tub. I saw every part of those clods of earth which rose above the surface of the water covered with ephemera, some of which had just begun to put off their coverings, others had almost entirely effected it, and others had completed it and were just taking wing; they were seen also in different parts of the surface of the water, busied about the same operations in different degrees of forwardness. While I enjoyed this spectacle, more agreeable than any thing I had expected,—while I had the pleasure of seeing so many aquatic beings changed into winged insects, and much nearer than I could have expected to see them in the river, the threatened storm arrived,



The Ephemera. A the larva in its worm state, B ditto in its nymph state, Z ditto in its imago state.

and drove me into the house: the only precaution I took on quitting my place with so much regret, was to cover the tub with a cloth, to prevent them from flying entirely away in my absence. The violence of the rain was not of long duration; in half an hour, that is to say, before nine o'clock, it permitted me to return once more to the garden. When the covering was taken off from the tub, the number of ephemera had considerably augmented, and they continued still to multiply under my eyes: many flew off, but I found many more which had been drowned.

“ The Ephemera which were already transformed, and continued still in the act of transformation, would have assuredly been enow to fill it sufficiently; but the number was prodigiously augmented by the continual accessions of strangers, who, attracted by the light, came thither from all quarters, the most part of them to be drowned. To prevent these from thus perishing, and to enable me to examine them in a perfect state, I caused the cloth to be spread over the tub, above which the light was held; immediately the cloth was almost concealed by the vast multitudes which fell upon it; and they could be gathered almost in handfuls upon the bottom of the candlestick. Those which fell were not, however, in the pitiful plight of those common moths which singe their wings by flying into the flame of a candle; they fell only because they were tired with flying; they seemed to alight because they were under the necessity of doing so.

“ But what I observed about the tub was nothing in comparison with that which I was about to see at the side of the river. I had been ignorant till this time of what was passing there; but the exclamations

of my gardener, who had descended to the bottom of the stair, called me thither. I stopped on the lowest step of the stair but one, it was then that I beheld a spectacle which far surpassed what I could have expected or desired. The quantity of ephemera which filled the air above the whole of the surface of that branch of the river, especially at that side of it where I stood, can neither be expressed nor conceived; but it was chiefly about me, and those who accompanied me, that it was the most prodigious. When snow falls thickest and in the largest flakes, the air is never so completely filled with them as that which surrounded us was with ephemera. Scarcely had I remained a few minutes in one place, when the step on which I stood was covered in every part with their bodies to the depth of two or three, and in some places it even exceeded four inches. The whole surface of the water for six feet at least in breadth beyond the steps was entirely covered with a coat of ephemera; those which the current, there slower than elsewhere, carried away, were more than replaced by those which fell continually in that place. I was several times obliged to abandon my station, by retreating to the top of the stair, not being able to sustain the shower of ephemera, which, not falling so perpendicularly as an ordinary shower, or with an obliquity equally constant, struck me uninterruptedly, and in a very troublesome manner, on all parts of the face. My eyes, mouth, nose, were filled with ephemera. Let not those who may have sometimes been disturbed in the fine evenings of summer by nocturnal butterflies, or moths, imagine that the inconvenience they may have then felt is to be compared with that of which I now speak;

for no comparison can be made between the numbers of these butterflies and that of the ephemera which now assailed us.

“ If it appears to be singular, that those butterflies which fly only in the night-time, and who seem to shun the day, should be precisely those which come in search of the light even into our apartments; it ought to seem still more extraordinary that the ephemera, which are destined to be born after the sun is set and the day closed in, and which are not permitted to see even the first blush of Aurora, should have such a marked attraction towards the light. It was a bad post to have charge of a candle on this occasion; he who held it in his hand had his whole body covered with these flies in an instant; they rushed to him from all parts in such quantities as to oppress him. The light of that candle occasioned, and put it in our power to see a spectacle altogether different from any thing that can be observed in any kind of meteorological shower; it was enchanting when once observed. All those who were with me, even to the grossest of the people, my domestics, never would have tired of admiring it. No astronomic sphere was ever formed so complicated as it was, nor furnished with so many circular zones in all manner of directions, having the flame of the candle for their common centre. Their number appeared to be infinite, having all possible degrees of obliquity with respect to each other, and which were more or less eccentric. Each zone was formed by an uninterrupted string of ephemera, which, as if tied together, followed each other close in the same line; they seemed to form a ribbon of silver bent into a circular form, and deeply indented on its edges: a

ribbon formed of equal triangles put end to end, so that the angles of those that followed were supported by the base of that which preceded it, the whole moving round with great quickness. Ephemera, whose wings only were then distinguishable, and which circulated around the light, formed this appearance. Each of these flies, after having described one or two orbits, fell to the earth, or into the water, but without having been burnt by the candle.

“ At the end of half an hour, and even sooner, the great shower of ephemera began to abate, the clouds of these flies were less dense, and became every moment less and less so: in short, after ten o'clock scarcely could any be seen above the river, and no more came near the candle.”

Mr. Reaumur was at some pains to inform himself whether this phenomenon occurred with the same regularity and at the same hour in other evenings; and he soon became satisfied that the metamorphosis of this insect into the fly state never does take place during the day, but that it commences usually about the same time in the evening, and that this kind of animal shower is nearly of the same duration from the beginning to the end of it each night as long as it continues: nor does this seem to be either accelerated or retarded by the heat or the cold of the atmosphere at the time. When the hour of transformation arrives, no circumstances, it would appear, can possibly retard it. It must go forward at all events, and they must submit to the lot which their destinies decree.

But though the numbers be immense that are thus brought forth in one evening, yet they are not all called into this state of existence at one time. Those

which are not ready to come forth at the appointed hour continue in reserve till the same hour the succeeding evening, when they make their appearance nearly in equal numbers as before, and so with a third; and though a few are found for some succeeding evenings, as well as those that precede the great fall, so that the harvest extends to six or seven evenings in all, yet they are so few in number towards the beginning and the end of that period, as scarcely to deserve notice.

Nor are these flies less regular in respect to the season of the year at which they make their appearance, than they are in regard to the time of the day. The phenomena above described took place at Paris upon the 19th of August; and by succeeding observations Mr. Reaumur discovered, that the same phenomenon takes place each year nearly about the same period, there being only a week, or a few days of variation; so that, like swallows and other birds of passage, they keep their appointed times with surprising regularity and exactness. In contemplating the hour of their appearance, our author remarks, "Whatever has been the temperature of the air during the day, whether it has been cold or hot for the season; whether the sun has shone forth with his utmost splendour, or has been obscured by clouds or rain, the hour at which our ephemera begin to put off their former robes is the same, and another hour appears to be marked out beyond which it is not permitted to them to do so. In less than two hours the number of these flies is so immense as to form clouds in the air, and to occasion a continued and heavy shower of these insects already enfeebled by age, and exhausted by fatigue; in two

hours more it has entirely ceased, and the air resumes its wonted serenity.

“But, what,” continues he, “has become of that prodigious quantity of flies when they no longer appear in the air? They are already dead or dying for the most part; a great, and a very great part of them have fallen into the river itself from whence they arose. The fishes have no days in the year in which they can make such a sumptuous regale, or in which they can gorge themselves with such delicate food: gluttons as they are, if they could foresee it, they would regret (like some gormandizers of the human race) that their stomachs could not receive the whole of the fine food that was at their disposal, and that they must suffer a great deal more to be lost than they could possibly devour. These days are then to them days of the highest regale; *manna* falls upon them from heaven. The fishermen have even given to these ephemera the name of manna; and it is by that name that they are known by them along the rivers of the kingdom. They say, that the manna has begun to appear, or that the manna fell in abundance on such a night, in order to denote that they have begun to perceive the ephemera, or that they have appeared in great abundance.

“Those which have fallen into the water and are not the prey of fishes, perish alike with the others; they are instantly drowned. The life of those which fall upon the banks of the river is not quite so short; but it had been better for them that their lives had been curtailed. Heaped above each other, without having sufficient force to move, they must remain in a very distressed condition until they die.”

Our author farther observes, that however short the

life of this fly is, it is sufficient to give them time to fulfil the only end for which they seem to have been produced; that of perpetuating the species: or rather, as he says, considering the short time that it remains in the fly state, to perpetuate the aquatic worms and the nymphs which proceed from them. The female ephemera appear to have no other business than to lay their eggs; and they seem to be in a condition to do this almost as soon as they are produced. The body of the female, if it be examined when even in its nymph state, is nearly filled with eggs. These eggs are disposed in the form of two large packets, each packet containing from 300 to 400 eggs; nor are these eggs deposited by the fly in succession, as in most other cases, but both the packets of eggs are extruded from the body at one time, through two openings formed for that purpose, and fall together in one accumulated mass. To enable the creature to extrude these, and at the same time to fill up the great vacuum in the abdomen that must thus instantaneously take place, the fly is provided with a couple of air-bladders, which it has the power of filling with air, and thus extruding the ovaries, and occupying their place.

One other singularity respecting this insect deserves to be particularly noticed; because, like that just mentioned, it concurs in facilitating those rapid operations which the short life of this insect renders so necessary. It is the facility with which they are born, as Reaumur expresses it, that is to say, with which they strip themselves of the slough of the nymph. The operation of casting off the exuviae of the chrysalis, or nymph, to most insects is attended with much difficulty and danger, and many die while they are endea-

vouring to effect it. But to the ephemera it is far from being so. "None of the insects that I know," says Mr. Reaumur, "executes an operation so great, which seems to be so laborious, and which really is so to the greatest part of them, with so much ease and celerity. The tub of which I have so often spoken, enabled me to observe them better than I could have done upon the river only. We do not draw our arm more quickly from the sleeve of a coat, than the ephemera draws its body, its wings, its legs, and the long filaments of its tail, from that complicated vestment which forms a kind of sheath for all these parts. Those ephemera who were about to transform themselves, whether upon the clods of earth in the tub, or even upon the surface of the water, had no sooner effected a rent in the corcelet, and that corcelet began to appear through that rent, than the rest of the operation was finished in an instant. I have often endeavoured to retard their progress, in order the better to observe how each part was contained within its respective sheath; I have seized a fly which began to disengage its head; I have pressed the head in the very instant when it began to show itself; I have even pushed the cruelty so far as to flatten and bruise the head under my fingers; but the metamorphosis, which I wished to suspend, was accomplished in spite of me. I have thrown into spirit of wine ephemera which had only escaped in part from their case; they, however, completely divested themselves of their exuviae in that powerful liquor, and perished immediately. Sometimes, indeed, it happens, that the filaments of the tail cannot be so quickly disengaged as the rest, so

that they fly away with their slough appended, and sometimes also these slender filaments are thus broken off.

Even short, however, as its life in the fly state is, this insect has to submit to one very difficult operation while in this state, that few of the longer lived insects undergo. It even quits another complete slough, over the whole body, wings, tail, and every other member after it has assumed its pupa state. But it is not surprising, if naturalists have not had opportunities of remarking these peculiarities with perfect accuracy. Reaumur was imperfectly acquainted with this operation, and obscurely describes it in one of the species. Geoffrey describes it more particularly; but not having adverted to the insect in its aquatic nymph state, he conceives it to be first a winged nymph that flies in the air before it assumes its pupa state. He observes, that when it is ready to change its state it rises to the surface of the water, and instantly quits its skin and becomes a *winged nymph*, flying to the first object it meets with, where it leaves a second slough, thin, white, and transparent, which is often found in summer attached to the panes of glass in windows, and then becomes a perfect fly. Reaumur describes the same phenomenon respecting a small diurnal ephemera which he once fell in with as he was travelling, and which covered the glass of the windows of his carriage with their exuviae. It is fully explained by De Geer.

The male of this kind of fly is easily distinguished from the female, and chiefly by means of the length of the fore legs and the tail. The females have always three long filaments in the tail, of which that in the middle is the longest; the male also has three filaments

there; but that in the middle is by much the shortest, it being not one fourth part the length of the others, but the fore legs of the males extend much farther than those of the female flies. There are other characteristic differences also which it is unnecessary here to specify.

There are many varieties of this class of insects, (Fabricius describes sixteen sorts, all of them natives of Europe except one, which is of Morocco) which differ from each other in diverse particulars, though they agree in regard to their general mode of living, and principal changes.—The larvæ of the whole live in the water and are transformed into vivaceous nymphs, which move about, and require food, while in that state. These larvæ have all six legs, pincers in the fore part of their head, and a long and slender body, with filamentous tails; but these filaments differ in conformation, and arrangement of their parts. They are all endowed with that set of organs which some have denominated gills, but these also differ greatly in their conformation, as has been already said. The larvæ vary also in regard to their mode of living, most of them moving about in the bottom of the water among the mud, without attempting to make holes in the banks. There are, however, considerable diversities in respect to the duration of their lives, both in their larvæ and pupa state; some of them continuing at least three years in the form of an aquatic insect; and some of them have been known to exist in their pupa state for several weeks. De Geer mentions one kind that has only one pair of wings. But it is unnecessary for us to enter farther into the particulars of these details on the present occasion.

The particular variety of ephemera here described, is an insect of a considerable size. Its body, independent of the tail, measures nearly one inch in length. There are many others of much smaller dimensions, some of them not exceeding one tenth part of this size. The most part of the ephemera tribe belong to the nocturnal class of flies; but some of them also make their appearance in the day time. They may all, however, be distinguished from every other class of insects, by the particular conformation and consistence of their wings, of which the reader may form an adequate idea from the engraving above given.

It accords in many respects with the *ephemera vulgaris* of Linnæus; which he describes specifically in the Syst. Nat. p. 901. No. I. But it differs from that [which has been described with great accuracy by De Geer] in the season of the year when the fly comes abroad, the duration of its life in the fly state, the form of its body, and various other particulars. The figures are taken from Reaumur, as I could find no specimen of the insect itself.

[To be continued.]

MISCELLANEOUS LITERATURE.

General Remarks on Historical Composition.

The proper study of mankind is man. POPE.

[Continued from Vol. II. page 460.]

THE poet from whom I have taken the quotation that stands at the top of this paper, never wrote a more unfortunate line, if it were to be judged of by

practice and not by *theory*. For though the whole world have been *speaking* about the study of mankind for many thousand years past; yet, when it is considered in a *practical* view, the operations of the human mind, as they tend to affect the welfare of society, seem scarcely to have been as yet begun to be adverted to. Since Voltaire wrote *his Histoire Generale*, most of our historical writers have indeed taken the hint from him, and talked of the progress of arts and civilization; but they talk of them as men who have formed their notions from theories only, and not from practical investigations; so that they serve to confound rather than to illustrate. The science of political economy too has been talked of for many years past in every country in Europe; yet the very first principles of that science have scarcely been begun to be established, though the world has been inundated with publications on that subject to such a degree as to perplex the wisest, and entangle the ignorant in the intricate mazes of error. Till these aberrations shall be corrected, we must be contented to trudge on in the dark and muddy paths in which we are bemired; nor can we hope to be benefited by disquisitions on the most important subject that can attract the notice of the historian, until the day shall arise that shall dissipate that darkness which now so generally prevails.

It appears to me, that our progress in this useful study has been chiefly retarded by the ill-judged efforts of many who have attempted to elucidate the subject of political economy. Most of those who have undertaken this task have exhibited it in the light of the most abstruse and incomprehensible of all sciences;

and in attempting to develope those principles on which they think it depends, they have been drawn into deep and endless calculations grounded on doubtful and unascertained facts, the conclusions deduced from which operate like rays diverging from a centre, which lead those who follow them farther and farther asunder the longer they proceed, till, by pursuing this *ignis fatuus* for a sufficient length of time, they lose themselves entirely, and, like a bewildered person, only exhaust their strength by the unavailing efforts they make to extricate themselves from that labyrinth in which they find themselves inclosed. To this cause I am willing to attribute the ineffectual exertion of so much ingenuity as has been idly displayed in those numberless intricate disquisitions on this subject which have been published in our day, and which will doubtless in future times be adduced as a striking characteristic of the folly of the present age.

Had the welfare of man depended upon the fallacious lights of his rational powers alone, he would have been in a situation much more deplorable than any other creature on this globe; and his whole race must have been utterly exterminated many thousand years ago. But such was not the will of Heaven; and that beneficent Being who endowed him with the reasoning faculty, saw it proper at the same time to confer upon him other propensities sufficiently powerful to counteract the baneful influence of this fallacious guide, on which his vanity would have induced him too often to lean with the most destructive confidence. Not only is his life individually preserved by the operation of these mere animal influences for the time allotted to it on this globe, and his species thus conti-

nued; but his existence also as a social being has, by it, been insured against the destructive ravages of this erroneous guide from the beginning of time until the present hour. It is not, therefore, in the depths of human ratiocination that we are to look for the first principle of that association which unites man to man, and impels him so to act as to preserve his existence as a social being under every variety of modification that the sophistry of philosophers, the tyranny of despots, or the madness of the mob, have been able to devise; but to another principle whose influence is universal, whose operation is steady as the motion of the heavenly bodies, whose power is irresistible, and whose duration must extend to the utmost period of human existence. To the developement of this principle alone then, under the various modifications of which it is susceptible, should the attention of those who wish to obtain a distinct view of the progress of civil society, be chiefly directed: and fortunately this, like all the other laws of nature, is so simple as to be comprehended with ease by any one who will bestow but a due attention to facts that come within the sphere of his own observation, without giving himself any trouble about those subtle disquisitions which may perplex, but never can tend to enlighten the understanding. I wish it were in my power to adduce a practical illustration of this momentous truth that should be sufficiently clear to prove impressive on the minds of all my readers; for then I should hope to be able to lead them into a train of investigation that would tend much to enlarge the sphere of their own enjoyments, and augment the comforts of others.

Let us then, for the sake of this kind of illustra-

tion, suppose, that we were to apply to one of those *regulating* philosophers who believe the wisdom of government to be of such sovereign influence in the affairs of this world, as that without its immediate interference every thing must run into confusion; that, in short, the happiness and the prosperity of a people is so intimately dependent on the influence of their governors, that unless these shall be at all times superlatively wise and good, and vigilant in the discharge of their duty, the public must be brought to the lowest ebb of wretchedness and misery. To a man professing these principles, and whom we shall farther suppose to be possessed of great talents and uncommon benevolence, we apply for a set of regulations that shall be the best calculated for providing such a city as London with a continued supply of all those necessaries, conveniences, and luxuries, which so vast a multitude of people, under such a diversity of circumstances, require; and that it shall be required, that matters shall be so arranged, as that there shall never be either a deficiency or a superabundance of any one article; that there shall be always enough to satisfy every individual when he calls for it, and not so much as to allow any of it to run to waste; while at the same time it can be bought at the very lowest price for which, in general, such articles can be there afforded, and so distributed every where as to be brought to the hand of every purchaser, without confusion or disturbance of any kind. And, in order that this system may be in every respect complete, we shall farther suppose, that the philosopher is to be endowed, not only with the privilege of making the regulations without any extraneous influence to derange his sys-

tem, but that he shall be farther invested with unlimited power to enforce these his regulations in the very best way that his superior wisdom shall direct. Let us now see in what manner this superior wisdom, power, and beneficence, under the regulation of the principle we have supposed, would exert itself.

In the first place, before his wisdom can be allowed to operate in providing the necessary supplies, he must know the precise number of the people who are to participate of them. An *exact* calculation, therefore, must be made of their precise number; but where are the data upon which these calculations are to be grounded? He will soon find reason to be satisfied, if he examines it, that parish registers, and every other source within his reach, would prove entirely fallacious in this respect. Let us, however, for a moment, suppose, that by a miracle he has got over this first rub. He has now to ascertain the precise quantity and kind of food, raiment, utensils, and furniture, that every individual of this multitude would require in a given time, otherwise too much or too little of any one sort may be ordered. We have allowed our governor talents; yet the extent of talents that would be necessary to ascertain all this, it will be easily seen, far exceeds the limited faculties of man. But suppose this rub also surmounted; he has next to make himself acquainted with the places from whence all the articles of convenience and luxury wanted are to be obtained, and to dispatch ships and messengers to every part of the world to bring them in the exact proportion required, and at the times that will be necessary. He has then to appoint purveyors in the country to buy up each article that is wanted, in its exact quantity; but how shall

he establish a correspondence between the whole, so as to prevent one from giving a greater price than another, or providing too much or too little of any one sort? Leaving these then for his wisdom to regulate, he must next have a body of carriers, waggoners, boatmen, &c. established, and put under such regulations as that they must each reach his place of destination at the time appointed, and bring with them the precise quantity of goods of each kind wanted at that time. To regulate these, and to see that they do not neglect their duty from carelessness, drunkenness, or any other allurements, there must be appointed over them a set of commissaries, officers, and inferior agents, who must be invested with very extensive powers, or their influence would be nugatory; and this will give occasion for another set of regulations to prevent these men from abusing their power. It is needless, however, to proceed farther in this sort of analysis; these hints, which do not embrace a thousandth part of what would be required, are sufficient to shew, that this regulating system of government, which is understood to originate in human wisdom and beneficence, supposes the exertion of powers that never were designed, and never can belong to man. It is, therefore, a chimera, the cherishing of which in a lesser or greater degree can only tend to derange that economy which the Supreme Being had ordained from the beginning of time to regulate the affairs of human society; and sorry we have been to see the baneful effects of such a system so often experienced, and so cruelly exemplified among mankind, without having, even until this hour, seen the abettors of that system branded with the contempt and detestation they should

justly excite; for, unfortunately for Europe, they are to be found intermingled among all sects, amidst all parties, and under every form of government that exists on the globe.

Let us now take a slight glance at the manner in which the simple principle ordained by the Creator universally to prevail, with a view to preserve the existence of society, operates, when it is not overruled by the oppressive weight of human institutions. With this view, we shall not have recourse to abstruse reasoning, but to plain facts,—to clear and undeniable experience alone, such as we find established by the practice of this metropolis. First, let us go to Billingsgate market; but we must be there by three o'clock in the morning, or we shall lose our errand. See what a multitude of boatmen, carmen, fishwomen, hucksters, and others, are all assembled together at this early hour, and with what keenness and alacrity every individual goes about his business! The bustle, the noise, the confusion, is distressing to the idle observer; but to those who are engaged it is nothing. The stalls are emptied in a moment, and again supplied before you can turn yourself twice round. Horses, carts, baskets, wheelbarrows, are seen going off in every direction, full (no one can tell where they are going, or what is to be made of them); while a fresh supply is pouring in from the other side with an equal rapidity. The imagination is confounded by the multiplicity of objects that are passing in succession, and the immense loads of fish that are thus disposed of and distributed with such profusion around. In two hours this bustle is all over, the street is cleared, and we are left at liberty to recollect ourselves a little. We

have now time to reflect, that all the persons we have seen, and many others who minister to these, have been thus deprived of their night's rest, not by the imperious command of a despot, but by their own free choice. Among all that multitude whom we have seen exerting themselves with so much vigour and alacrity, there is not, perhaps, a dozen of individuals who might not, if they had so chosen, been sleeping quietly in their beds, without being liable to be punished by any one. And for whose behoof are they subjecting themselves to all this watching and toil? For the accommodation of persons whom they know not, nor ever saw, and possibly may never hear of; for persons who are indulging their repose, not bestowing the smallest thought either on those who are now catering for them, the provisions they are collecting on their account, or the places from whence they came. Each is indulging his own inclinations, without regard to the other; yet each in his way is contributing to supply the wants or augment the gratifications of the other. It is in this way that the operations of nature are universally conducted. Individuals are only mindful of themselves, while they are busy in providing for the welfare of the whole.

Let us farther take a turn on the street after breakfast. We are now no longer at a loss to know what has become of the innumerable loads of fish that we saw going away in the morning. We see them laid out on the stalls in every street, with a neatness and cleanliness that invites the passenger to purchase. No one needs to go a great distance from home to make his purchase, for they are every where brought to his hand. His convenience is thus attended to, without

his bestowing a thought on the subject, in a much more effectual manner than could ever have been effected by the restrictions of laws, or the severity of punishments.

Go to Covent-garden market—the case is the same. Carts, waggons, and people in great multitudes; have been travelling all night from various distances, to be there by the peep of day, for the purpose of disposing of the various productions of the garden. Chaffing-dishes are placed in every street with warm saloop, to afford a seasonable refreshment to the travellers, often benumbed with cold before they reach the market-place. Such attentions prove highly gratifying; yet these people are, in point of benevolence and kindness, in no respect superior to the common run; they are not righteous above other men, though they be so uncommonly polite and alert in providing for their accommodation. They are merely attentive to their own interests. It is this principle alone that actuates their conduct, and gives them that inviting solicitude to provide the accommodation you want, as it does that of all the others; and however low in the estimation of the *illuminati* this principle may be held, we can easily perceive, by these hints, that it was not in vain so deeply implanted by the Creator in the mind of man; and it is from the developement of this principle alone, that arise all those harmonies which unite men together in amicable society; and not compulsory laws, which, though they may operate in a merely negative capacity in preventing crimes, cannot, perhaps in any one instance, be productive of positive good. The following dialogue, however insignificant in itself, affords such a beautiful lesson in the art of political

economy, that I shall hope to be excused for introducing it in this place.

As I have ever found, with the great Boyle, that more may be learnt by attending to the conduct of persons employed in actual business for one hour, than from speculative reasoning upon it for a year, I frequently walk through the market places to observe the objects which there present themselves, and to ask such questions as may be suggested by passing circumstances. One day, as I was going thus through Covent-garden market, a large hamper, filled with garden snails, attracted my notice. The lid was open, and many of them, of a very large size, were crawling all over it. And “pray, madam,” said I, addressing myself to a woman who attended them, “may I use the freedom to ask what you make of these snails?” She answered me with politeness and urbanity, ‘I sell them, Sir.’ I could not help inwardly smiling at the simplicity of my question, and the ingenuous *naïveté* of her answer. I proceeded—“Can you tell me what the persons who buy them of you make of them?”—‘I really do not know, Sir.’—“And where, madam, do you get them?”—‘I buy them.’—“Where then, can you tell me, do those who sell them to you get them?”—‘I don’t know,’ was the answer. And here the dialogue ended. This, said I to myself, when I had time to reflect a little upon the subject, is exactly as it should be. This good woman, by keeping her constant station in the market, finds that there is a steady demand from her for this article to such an amount, and that the price she draws enables her to give a certain price for them from another, and leave her a living profit. She makes it known to those who

are in the way of furnishing such an article, that she is willing to give such a price for it. This price is enough to indemnify the collector for his trouble, and therefore he brings it. If more be brought for sale than satisfies the demand, the price is lowered of course. If that price falls too low to satisfy the person who furnishes the article, the supply is diminished or discontinued, unless the price be so far raised as to encourage the farther production of it. By this kind of vibration, the price of every article, and the quantity brought to market, adapt themselves, in all cases, with great exactness to the demand; and thus in a silent and imperceptible manner, without bustle or coercion of any kind, is every individual provided with a sufficiency of each article without superabundance. In this way also it is, that without trouble or forethought on the part of the buyer, and often without his knowing what the article is that he buys, or whence it comes, he finds it ready for his service whenever he calls for it. Thousands of eyes, more wakeful than those of Argus, are thus perpetually upon the watch for us in every different part of the world, both when we wake and when we sleep; nor does any danger deter, or difficulty put a stop to those labours which are so necessary for our subsistence or welfare, though many of us never heard of, nor ever suspected that any such operations were going forward.

Such is the general train of human events, and such the simple and undeviating principle on which the existence and the well-being of civil society depend. Under its influence the people in all ages have participated of the blessings of life, in spite of wars, revolutions, and every other pernicious influence that

the weakness of ingenuity hath been able to devise; these regulations may disturb, but cannot destroy it. The wise man who, having once perceived the influence of this principle, and traced its operations with care, till its wonderfully benign tendencies have been fully recognised, contemplates it with the same degree of reverential admiration that he feels on deeply investigating any of the other sublime dispensations of nature, and deprecates the baneful effects of those institutions which oftentimes an ill-directed beneficence, stimulated by vanity, have induced even good men to adopt, so as to interrupt its salutary operations. When such interruptions do not occur, all the individuals in a state may be said to be engaged in a race in which each, having in view a prize which is of great value in his eyes, exerts the utmost of his powers to obtain it. To insure the complete exertion of these powers, therefore, nothing more is necessary than to give full scope to his powers, and a convincing certainty that the prize he pants after, when attained, shall be entirely his own; and to guard against jostling in the course, or any other foul play that might retard his progress. Such and such alone are the duties that are required in a wise administration of government.

Were historians and investigators to trace, with a greater degree of accuracy than they have hitherto done, the effects that have been produced on society by those institutions that have tended to retard or encourage the development of this principle, instead of hunting after ingenious and theoretical speculations, they might confer a great benefit on mankind.

The following fragments of a memoir by M. d'Alembert relating to his own life have been translated by a friend whose name would do honour to this miscellany were the Editor permitted to mention it. Those who are partial to the cause of literature, will be pleased to see this unsophisticated account of a man of great influence appear under such a plain but elegant dress in the English language.

Memoirs of the Life of M. d'Alembert.

JEAN LE ROND D'ALEMBERT of the French Academy, member also of the Academies of Sciences at Paris, at Berlin, and at St. Petersburg, fellow of the Royal Society at London, of the Institute at Bologna, of the Royal Academy of Belles Lettres in Sweden, and of the Royal Societies of Turin and of Norway, was born at Paris the sixteenth of November 1717.

Upon his quitting the class of philosophy which he studied at the college Mazarin, he was received master of arts in 1735. He studied afterwards civil law, and was received advocate in 1738. But feeling very little inclination to the study of jurisprudence, he resolved to study physic, having need of a profession to make up for the smallness of his fortune. This last, however, he followed but a year, an invincible attraction to the mathematics forcing him to renounce all other studies.

Some memoirs which he gave to the academy of sciences at Paris in 1739 and in 1740, among which was a memoir on the refraction of solid bodies, which contained a new and curious theory relative to this refraction, and another on integral calculations, made

him be wished for as a member of this society, of which he was chosen in 1741, when but twenty-three years old. Since then he has given to the public a great variety of works on mathematics, the list of which is subjoined to this sketch.

In 1746 he obtained the prize from the academy at Berlin, "upon the general cause of the winds;" and this work, which obtained him the laurel, was also the cause of his having the honour to be elected member of this academy without the usual scrutiny, and by acclamation.

In 1752 the king of Prussia made him the offer of the reversion of the chair of president of the academy of Berlin, which was then filled by M. de Maupertuis, who at that period was dangerously ill. The refusal of this offer by M. d'Alembert did not prevent this prince from giving him in 1754 a pension of twelve hundred livres (fifty guineas) which was the first pecuniary gratification M. d'Alembert ever received.

At the end of this same year 1754 he was elected by the French Academy in the place of M. Surian, bishop of Vence.

In the month of July 1755. he went to Wesel by invitation from the king of Prussia, who was at that time there. This prince overpowered M. d'Alembert by his goodness, and admitted him to the honour of his table.

At the end of the same year he was received, through the recommendation of the Pope, Benedict XIV, member of the Institute of Bologna. M. d'Alembert had never solicited this place. The Pope only knew

him by reputation; and, though there was at the time a law in force in the Institute of Bologna to prevent any new academicians from being received until there should be three vacancies by death, Benedict XIV requested that this regulation should be overlooked in favour of M. d'Alembert.

In 1756 the king of France granted him a pension of twelve hundred livres upon the royal treasury; and the Academy of Sciences gave him at the same time the title and rights of a supernumerary pensioner, though there was not a vacancy. This favour had not hitherto been granted to any one.

This year of 1756 the present dowager queen of Sweden, sister to the king of Prussia, having formed an academy of Belles Lettres, which were to meet in her palace, and over which she intended to preside herself, ordered the Baron de Scheffer to offer M. d'Alembert a place as foreign associate, which he accepted with gratitude.

At the end of the year 1762, Catherine, empress of Russia, made him the offer of superintending the education of her son, the present emperor of Russia, with appointments to the amount of one hundred thousand livres per annum, through M. de Soltikof, the minister she had at that time at Paris. M. d'Alembert refused to undertake this charge. The empress pressed him again by a letter written in her own hand, and which has been printed in the public papers. But the attachment which M. d'Alembert had for his country and for his friends made him again resist this second proposal.

M. d'Alembert having communicated this letter to

the French Academy, that society resolved unanimously, that it should be inserted in their registers as an honourable monument to one of its members, and to literature.

In 1763, immediately after the conclusion of the peace, he went, according to the invitation of the king of Prussia, to pass some months at the court of that prince, who gave him apartments near to his own in his palace, admitted him every day to his table, and gave him every mark of his esteem, goodness, and even of his confidence.

The same year M. d'Alembert received the most honourable reception at the court of Brunswick-Wolfenbüttele, where he went in company with the king of Prussia.

The king of Prussia did every thing in his power during the time M. d'Alembert had the honour to pass with his majesty, to engage him to accept the chair of President of the Academy at Berlin, vacant since 1759 by the death of M. de Maupertuis. The same motives which had prevented M. d'Alembert from acceding to the desires of the empress of Russia, did not permit him to accept of the offers of Frederick, notwithstanding all the obligations he had to this prince.

He represented to him besides that there were members of the academy of Berlin of the greatest merit, worthy in every respect to occupy this place, whom he would not, nor ought not in any way to deprive of it. This did not however prevent the king of Prussia from writing in his own hand to M. d'Alembert, two days before his departure from Berlin, that he

should nominate no one to the place, until it should please M. d'Alembert to come and fill it. And this place in effect remained vacant.

In 1768 M. d'Alembert having spoken a discourse in the Academy of Sciences in presence of the king of Denmark, which has been printed in the volume of the academy's transactions for 1768, and in different journals, a manuscript copy of this speech having fallen into the hands of the infant duke of Parma, he translated it into Italian, which he sent in his own hand to M. d'Alembert. He some time afterwards sent another letter, written by himself, full of sentiments of esteem for letters in general, and particularly for M. d'Alembert.

M. d'Alembert has received also many letters from the empress of Russia, the king of Denmark, the prince royal of Prussia, and the princes of Brunswick, all written in their own hands. The king of Prussia does him the honour to write often to him; and he preserves a great number of letters from this prince, which, if respect would permit M. d'Alembert to make public, would do the greatest honour to the understanding, the acquirements, the philosophy, and to the bounty of this monarch.

Besides the works on mathematical subjects of M. d'Alembert, which amount to fifteen volumes in quarto, he has published separately five volumes in twelves of "Miscellanies of Literature, History, and Philosophy."

He has revised all the mathematical part, and natural philosophy in general of the Encyclopædia; and he has even new-modelled the whole, or nearly so.

Many considerable articles relative to these sciences, and which contain, upon elementary objects, novelties which would be vainly sought for elsewhere. One may cite the articles, "Las irreductible, Courbe, Equation, differential, figure de la Terre, Geometrie, Infini, &c." and a great number of others.

Besides these articles M. d'Alembert has given a very considerable number of others of pure literature, or of philosophy; one may cite the flowing articles, "Elemens des Sciences, Erudition, Dictionnaire," and many others less considerable, without reckoning a variety of synonymous ones.

There are in the different volumes of the Academies of Sciences of Paris and Berlin many papers from M. d'Alembert, the greater part upon objects of transcendant geometry.

On Scotticisms and Anglicisms.

[Continued from Vol. II. page 444.]

IN compliance with the same enervating spirit of innovation which we have had so often occasion to reprehend in this essay, the word *bundle* has been kicked quite out of doors, and *parcel* substituted in its stead. We must no longer repeat the fable of the old man and his *bundle* of sticks; nor say a *bundle* of dirty linens; but a *parcel* of sticks, or a *parcel* of linens: as if the mind could recognise no distinction between a congeries of things huddled together without order or arrangement, which constitutes a *bundle*, and a number of things symmetrically arranged and tied up in regular order, which forms a *parcel*. If the mind cannot grasp the idea of this distinction, it would be idle to have words

to express it; but if the idea can be conceived, that language which can denote it neatly and clearly is certainly more perfect than another which expresses it in a blundering manner, and is incapable of marking such distinctions.

In conformity with this mode of beautifying and improving our language, we are taught on no account to make use of the word *Byre* to denote a house appropriated to the keeping of cows. In its stead, we are taught to say *cow-house*, or *stable*, whichever we please. But if I use the word *stable*, I force a word which has a precise and appropriate meaning (viz. a house for keeping horses) to express another meaning, which tends only to occasion ambiguity and mistake; and if I use *cow-house*, it is certainly a degradation of the language, tending to impoverish it. By the same rule we ought to banish from the language the appropriate phrases *stable*, *dog-kennel*, *hog-stye*, *granary*, *scullery*, *laundry*, and in their place say, *horse-house*, *dog-house*, *hog-house*, *grain-house*, *dish-washing-house*, *clothes-dressing-house*, and so on. Would not this be a great refinement in respect to the energy and elegance of the language? I recollect to have been once in company with a Dutchman, who took notice, as a very great elegance in his own language over the English, that instead of the word *glove*, in English, they expressed the same idea *with much more elegance* by calling it a *hand-shoe*; but when I remarked that, according to the same rule, his language would be still farther improved by banishing the terms expressive of what we call a *hat*, a *coat*, *breeches*, *stockings*, &c. and calling them, re-

spectively, a head-shoe, body-shoe, thigh-shoe, and leg-shoe, he seemed to demur as to the beauty of these arrangements: and I suppose that few will contend, that the phrase *fingers of the feet* instead of toes, or great finger instead of thumb, are apt illustrations of the copiousness or richness of the French language; yet such a refinement precisely as that of which I speak, it would be to banish the word thumb from our language, and in its place adopt the phrase *great-finger*.

In such refinements of our vernacular language, as Dr. Johnson would have called it, we are, however, making great and daily advances. Among many other proofs of the delicacy of our minds, and the vast refinement of our ideas, which hath such a powerful tendency to banish from it all those barbarisms that the rude unpolished notions of our savage forefathers introduced, we cannot but pride ourselves on the happy invention of converting the obnoxious word *breeches* into the clear, elegant, and *purely definite* phrase *small clothes*, or the still more superlatively delicate one, *inexpressibles*, which will remain as a lasting monument to posterity of the superlative delicacy of philosophical minds in the present age.

Swift, I think, has somewhere said that such refinements in language indicate the grossness of the ideas of those who introduce them; and I am inclined to think that a person whose mind was uncontaminated by the vulgarisms of fashion, would see no more reason for altering the word *breeches*, than that of petticoat, or hat, or gloves, or any other part of dress. But, if the grossness of their ideas will induce

the fashionable world to make such alterations,—in the name of common sense let me beg that they will at least exert their ingenuity so far as to invent a word that will not necessarily introduce confusion and ambiguity into the language. It indicates, indeed, a wondrous poverty of ideas in these word-inventors, that if they must introduce an ambiguous phrase, they could not have contrived to make it of that kind which their great patterns in refinement call a *double entendre*, for this they seem to consider as the *ne plus ultra* of polite refinement in conversation. What a delicate name did these their patterns invent some time ago for a particular part of dress, when they called it *pet en l'air*! I asked a lady who had been lately in France if that was still known there. “O yes,” said she, “it is quite common, I have heard *pet en l'air de madame* very often.” It seems this fashion has continued longer in vogue there than most others; for, on the authority of one of their gravest philosophers, I can prove that the thing was equally well known, as it is now, above sixty years ago.

An honest farmer, in an account he published of the state of agriculture in Scotland several years ago, afforded a hearty laugh to his readers, by relating “that a certain field was well manured by penning upon it so many scores of *highlanders* for two months;” and justly they laughed at this absurd phrase. Yet, among modern Anglicisms, no one seems to be less taken notice of (for it is admitted even into the politest circles) than the phrase equally laughable, “*highland Scott.*” This Scotsman says, “he dungs his field by penning on it so many scores of *highlanders*;”

the Englishman says, "he fed so many scores of *highland Scotts* upon the grafs of his meadows." Both phrases are doubtless equally absurd, and of course are alike deserving of ridicule; yet the *first* was only the blunder of an individual, unauthorised by any collateral support, while the *last* is an established phrase used by the gravest writers. Whence arises this difference? It deserves to be explained; for it will serve to bring to light one of those numerous circumstances which tend to debase a language, when no one thinks of preserving its purity by exposing the absurdity of inconsiderate innovations.

The English will say, that the phrase "*highland Scott*" was imported from Scotland; but that is not the case. The phrase was never heard in that country; nor would the people there know what it means. The genuine phrase from which this has been derived is *highland stot*. A *stot* is one of those numerous definite words which have been driven out of the English language by literary refiners, without substituting any other, that I know of, in its stead. It denotes "a young ox which has not yet attained his full size," being exactly equivalent to the English word *heifer*, but of the imperfect gender, as I would call it, instead of the feminine. Now, it is the custom in the highlands of Scotland, in which many cattle are bred, to arrange their beasts in classes of the same kind when they carry them to market; the young mutilated males, forming one of these classes, is called a class, or drove as they call it, of *stots*; and, to distinguish the highland from the lowland breed of cattle of the same denomination, they are called *highland*

stots, which name conveys a clear and distinct idea to every person in that country who hears it used; but, when these droves of cattle come into England, the word *stot* not being understood; some one, of wondrous *sapience*, no doubt, in his own opinion, instead of asking the meaning of it of those who could have informed him; knowing that the highlands from whence they came is in Scotland, *profoundly* concluded it must be highland *scots*; and highland *scots* he called them, and highland *scots* others have called them too, in emulation of his *bright* example. Men from the same district are called *scots highlanders*, and cattle *highland scots*. A stranger, to whom this phraseology had not been explained, would find some difficulty in discovering which of these phrases denoted the men, and which the beasts; or whether they did not both denote men, or both beasts. Such is the perspicuity obtained by these elegant refinements!

One other Anglicism of a similar kind, though it cannot claim kindred with any Scotticism that I know, is the common phrase *good bye*, which is pronounced so much like *good boy*, that when a stranger who is a little versant in the English language hears it addressed to a girl, he cannot help being struck with the seeming incongruity of the phrase. This naturally induces one to try to trace the origin of it: nor is that difficult to find. Every one knows that this phrase is only used at parting with any one, and denotes a kind valediction to the person addressed similar to that of *good night*, which is evidently a contraction of "I wish you a good night's rest." *Good bye* is a more general valediction, and is evidently a corrupted contraction of

God be with you, or good be to (with) you, if you please. Thus do we first lose the meaning of a phrase by false pronunciation; we then alter the spelling of it; and afterward give it another meaning to accord with the new orthography we have given to it. A fine example of this species of literary legerdemain, which has taken place in my own time, will serve as an apt illustration of this kind of mutation of language.

It happened that the art of writing was invented before the art of printing; and as printed characters are of necessity more uniform in their figure than written characters ever can be, it necessarily follows that many letters were once written differently from what are now used. It happened that in old times the letter y was written so like the modern z that they could not be easily distinguished from each other; in short, they were confounded with each like the j and the I, or like the v and the w. In consequence of this it happened, that printers in old times frequently printed the words your, year, &c. with a z, zour, zear, though it is well known that these words were always pronounced with the y soft, as at present. Printers at length, observing this mistake, corrected the error, and writers, imitating them in general, adopted the same mode of spelling, and wrote their y so distinctly as not to be confounded with the z, except in a few words, especially proper names, such as Menzies and M'Kenzie, in which they retained the old spelling, though they still *pronounced* the words as they had heretofore done zour and zear, as if they had been written your and year. These names, therefore, were always pronounced, and properly, as if they had had a

modern y in the place of the ancient y, which assumed the shape of a z, and were, of course, Menyies and M'Kenye; now, however, the gentlemen to whom these names belonged, in order to show that they will be in the fashion of rendering *obscurum per obscurios*, have absolutely laid aside their original name, as if they were ashamed of it, and have taken up another which their forefathers never knew, and would not own could they appear again upon this earth. Such are the glorious improvements which the *deep* researches of modern philologists so happily introduce! Such is the despotic power in modern times of the once salutary *jus et norma loquendi*.

Wherever an idea occurs that cannot be neatly and distinctly expressed by any word in the language, I should think the nation in general indebted to any one who should introduce an apt and adequate word for that purpose. On this principle, though I cannot say much for the elegance or analogical propriety of Mr. Pitt's (lord Chatham) *parallellality*, or Mr. Fox's *reciprocity*, yet I should consider these words as still better than none; far less should I object to the honest country man's *straighttality* and *levelity*, which he adopted for the purpose of expressing his ideas, perhaps without knowing that they were not in general use. The case was this: a nobleman in the northern part of this island, who used to ride out occasionally without any attendant accompanying him, for the purpose of conversing freely with those whom he should fall in with on the road, having come up with a country farmer who knew him not, entered into conversation about the state of the roads. His lord-

ship observed that the direction of the road had been lately altered in that neighbourhood, and asked if the other could tell him why that alteration had been made? "O yes," said the farmer, "that I can do. You must know, that a gentleman who lived in the house that you see among yonder trees, and who died about three years ago, had, during his lifetime, a principal hand in directing all the roads in this corner of the country; but he had such a fondness for *straight-ality*, that he would not willingly have allowed a road to bend in the least to the right hand or to the left on any account whatever; and you may see that he took the road straight over yonder hill, and then down again into this valley, and then up that hill beyond the bridge. But no sooner was he laid in his grave, than another gentleman who lives about ten miles off came forward, and he has since that time carried every thing in the road way as he likes. Now, this gentleman has as great a fondness for *levelity* as the other had for *straightality*, and he would not willingly allow a road to go one inch up or down hill if it could be avoided; so that he makes it turn and wind in any direction, if it can but be made still to preserve its *levelity*. Instead of going over the top of that hill, you see, we are all this time winding round the bottom of it, and now that we are almost at the bridge, you will perceive that we have scarcely ascended or descended ten feet since we crossed the other bridge: and so it goes on beyond the bridge before us along the valley, as you will see in a little." "And which of these two," asked his lordship, "do you like best?" "As for that," said the honest man, "were it not

for the waste of money thrown away on making so many roads, there is no sort of comparison between them; for I can carry as great a load with one horse upon this road as I could do with three on the other, and take as little time to perform the journey too; for the distance is scarcely greater the one way than the other." Now, as it is plain that without the two words which the honest man invented, the ideas that he meant to convey could not have been expressed without constructing the sentence after a different manner, I can see no good reason for rejecting these two words (or at least for adopting others of the same import more analogically formed), but much the reverse; nor can I be satisfied that we do right in adopting the more faulty expressions of the two great men above quoted, while we laugh at the poor country man for lending his aid to enrich his native tongue; for it will not be denied, that whatever adds to the power of varying the mode of expression, without diminishing the perspicuity of a language, must have a tendency to enrich it.

To the word *straightality* a friend to whom the above passage was showed objected as being formed, he said, not according to the usual analogy of the language, as the termination *ality* never occurs but where the original word ends in *al*, as *mortal*, *mortality*; *general*, *generality*. "Straightality from *straight*, seems therefore, says he, a most uncouth invention. Dr. A. as a scholar, would not, I think, have formed such a word;" [Agreed.] "And I must think that in this instance the *scholar* concedes too much to the *farmer*." I like such remarks as these.

It is what I wish for. But what shall we say to the scholar who admits of the word *paralellality* from *parallel*? Ought it not to have been *parallel-ity*, as from *infidel*, *infidel-ity*? I brought this mode of formation by the *farmer* as a parallel to that of the *peer*, with this difference in his favour, that the farmer could say he might have a desire to *straight-all* (for all roads) from which he might not unnaturally derive the uncouth word, if you will, *straight-al-ity*; whereas the *peer* could in no wise join the syllable *al* to the end of his *parallel* to help him out with his *parallel-ality*. But if we find difficulty to reconcile the word of the *peer* to the law of strict analogy, we shall have still more difficulty to do so with that of the *orator*. *Recipro-city*! the fellow to this word is no where to be found; it is not only formed contrary to every rule of analogy in the English language, but it is at the same time so hard to pronounce, that it puts me always in mind of eating a choke-pear, which will not go down, but sticks in the throat. If he was to depart from all rules, what in the name of wonder prevented him from making at least a smooth word, as he might have done by cutting off only one syllable more, when it would have been *recipr-ity*? But why depart from the analogy at all in this case? *Reciprocal-ity* would have been quite regular, and not unharmonious. Does not the *scholar*, by adopting this word without hesitation, concede too much to the *orator*? And does it not become the *man* to call the attention of the public to such culpable adulation, by the aid of such illustrations as are most likely to attract notice? While, therefore, I attend with a reverential respect to the efforts of such enlightened critics.

as watch with care to guard against *unnecessary* innovations in language, I behold with the most ineffable contempt the pitiful nibblings of those enervated sniffers, who without cause or consideration yield up the powers of their understanding to the guidance of another; and who approve of every thing as good which has been practised by him, and condemn by the lump every phrase which he had not had the ingenuity to discover or the ingenuousness to approve. Language is the work of reason aided by experience; nor can it ever be carried to such perfection as not to admit of being farther improved by the chastened use of those faculties. If a word can be found which in sound and other respects is analogous to the genius of our language, and clearly enounces an idea which cannot be expressed by any word already in use, why should we deprive ourselves of the advantage of using it under the notion that it is a *Scotticism*, an *Anglicism*, an *Irishism*, or any other *ism* whatever? It is, in particular, extremely absurd to avoid *Scottish* words with so much anxiety as has been discovered of late years, seeing that many of these are pure English words, which have been suffered to fall into disuse through the ignorance or affectation of the times; and which, by being replaced, would only tend to render the language more stable than it has been, and prevent those fluctuations which so speedily deprive us of the power of reading some of our best authors. I have had occasion in the former part of these remarks to point out several such words; and I may here be allowed to add, that owing to this circumstance, I can myself have the satisfaction of reading Shake-

speare, and other authors of that age, with a facility that no mere Englishman can ever enjoy, seeing many of those words which have puzzled the commentators to an extraordinary degree, and produced whole volumes of conjecture and controversy, have been quite familiar to me from my infancy; of which, if these remarks shall be deemed worth notice by my readers, I shall take occasion to give some examples in the future numbers of this work.

Some Account of a new discovered and valuable kind of Coutchouc, in the Islands of Pulo-pinang and Sumatra in the East Indies.

AMONG the discoveries that have been lately made in India, in consequence of that active spirit of research which has been so universally diffused through all the natives of Europe settled in that country, few promise to be of greater utility, than that of a new species of *Coutchouc*, or Indian rubber, which possesses all the estimable qualities of the American *Coutchouc*, together with some others that bid fair to render it of much greater utility in arts and domestic economy; a few of which I shall beg leave, in this place, slightly to glance at.

It is not many years since the substance called Indian rubber was first introduced into Europe; but the very singular qualities it possesses of elasticity, inflammability, and indissolubility in acids, in water, and other common solvents, soon attracted the attention of philosophical inquirers to the origin of this substance, and the preparations it had undergone before it was exhibited for sale. It soon came to be under-

stood, that it was the inspissated juice of a tree, a native of Guiana and other provinces on the eastern coasts of South America, which was there known under the name of *Hevea*, and which was recognised by Linnæus to be a species of the *Iatropa*; nor was it, for many years, suspected that a substance possessing similar qualities could be obtained from any other plant. Some specimens, however, of substances approaching in qualities to the American Coutchouc, though differing from it in some particulars, having been accidentally found in various other parts of the globe, excited a suspicion that there might be many other plants that afford juices possessing qualities of the same sort, which has caused experiments to be made that clearly evince the certainty of this fact. There is a kind of Coutchouc that comes from China, which is not, in all probability, the produce of the *Hevea*. I have myself seen a kind of Coutchouc that was brought by a ship-master from the coast of Guinea, which he himself made from the juice of a tree in that country that he could not scientifically describe; and which, though much resembling the Coutchouc of America, appeared to me not to be entirely the same. Some specimens of this I believe I can still obtain, should any gentleman who has skill and leisure for experiments wish to have them for that purpose; and of the benefits that may be derived from such experiments I shall soon have occasion to adduce some powerful illustrations. It is now also well known, that many plants of the torrid zone afford a juice which, when inspissated, approaches to the nature of Coutchouc in several respects; among which may be

ranked the *Ficus religiosus et indica*, the *artocarpus integrifolia*, *Hippomane biglandulosa*, *Cecropea peltata*, &c.; there are even some plants of European produce which possess a similar quality, particularly the *chondrilla juncea*, Linn. a native of the south of France; the milky juice of the common fig-tree, that of several kinds of the *Tythemales* and *Apocynium*, the white misletoe (*viscum album*. Linn.) are said to possess many of the properties of the Coutchouc; and Mr. Faujas de St. Fond gives a preparation of the viscid juice obtained from the common holly, which, for some purposes, may be substituted for the Coutchouc.

But none of the substances that have yet been discovered so nearly resembles the original Indian rubber of America in its most valuable qualities, as that which forms the subject of the present memoir. It was accidentally observed in the island of *Pulo-pinang*, off the coast of Malacca, adhering to the wounded parts of a rambling plant that grows there to an immense height, supporting itself upon trees, and running from one to another for many hundred yards in length; so that it was not without some difficulty that the parts of fructification could be obtained, so as to ascertain its botanical characters. It is also found in the island of Sumatra, whence Dr. Roxburgh (to whom the world is indebted for innumerable botanical discoveries in India) obtained perfect specimens by the care of Dr. Charles Campbell of *Fort Marlburgh*, so as to be enabled perfectly to identify the plant, by ascertaining its botanical characters.

The juice which affords this concrete is, like all the others that afford any thing of a similar quality, of milky consistence. It is indeed described by Mr

Howison (who first communicated to the Asiatic society an account of the tree that yielded it, under the name of the *Elastic gum vine*), as so much resembling animal milk in its most obvious appearances, that it might be easily mistaken for it by a careless observer. "The best juice," says he, "is always produced from the oldest vines. From them it is often obtained in a consistence equal to thick cream, which will yield two thirds of its own weight in gum.

"The chemical properties of this vegetable milk, so far as I have had an opportunity of examining them, surprisingly resemble those of animal milk. From its decomposition, in consequence of spontaneous fermentation, or by the addition of acids [Qu. did he try the animal acid of the stomach of creatures living upon milk,—rennet?] a separation took place between its *caseous* and *serous* parts, both of which are very similar to those produced by the same processes from animal milk. An oily or butyraceous matter is also one of its component parts, which appears upon the surface of the gum as soon as the latter has attained its solid form. The presence of this considerably impeded the progress of my experiments, as will be seen hereafter.

"I was at some trouble in endeavouring to form an extract of this milk so as to approach to the consistence of new butter, by which I hoped to retard its fermentative stage, without depriving it of its useful qualities; but, as I had no apparatus for distilling, the surface of the milk that was exposed to the air instantly formed a solid coat, by which the evaporation was in a great degree prevented. I, however, learned, by collecting the thickened milk from the inside of the

coats, and depositing it in a jelly pot, that if excluded from the air, it might be preserved in this state for a considerable length of time.

“ I have kept it in bottles, without any preparation, tolerably good, upwards of one year; for, notwithstanding the fermentation soon takes place, the decomposition in consequence is only partial, and what remains fluid still retains its original properties, although considerably diminished.”

Mr. Howison then proceeds to detail the manner in which he made gloves, boots, and various other articles of this substance, by first making molds of wax of the proper size and shape, and then covering them with the juice. He found that the immersing the mold in the milk and then exposing it to the air did not at all answer upon trial; “ that fluid running almost entirely off, although none of the oily matter was present.” Neither did he find that a brush answered well for laying it upon the mold; for the moment a brush was wet with that fluid, the hair became united as one mass. In short, he found no mode answer so well as that of dipping the fingers in the fluid, and then rubbing it with some degree of pressure all over the molds.

When so wetted, the molds, hung upon a peg over a vessel placed for receiving the drippings, were usually so dry as to admit of receiving another coating in the space of ten minutes: however, “ after every second coat, the oily matter before mentioned was in such a quantity upon the surface, that, until washed off with soap and water, I found it impossible to apply any more milk with effect; for, if laid on, it kept running and dividing like water upon wax.”

He found that thirty coatings were required before it attained the usual thickness of the bottles that come from America.

He made in this way very neat gloves and boots, and for these uses it seems to be much superior to the American Coutchouc, on account of its possessing none of that clamminess when wetted that is observable in the other.

But, although he contrived to give his boots soles, heels, and straps by a very simple and easy process, yet he found that the boots in a short time lost their shape, and were subjected to other inconveniences, which he thinks would render them unfit for dress where elegance is required; but for fishermen, and others who are necessarily obliged to be long in water, they may prove useful, as they entirely prevent all access to that fluid.

Our ingenious experimenter having conceived an idea, that if an elastic cloth, in some degree correspondent to the elasticity of the gum, were used, the defects abovementioned might be in a great measure remedied, he accordingly made his first experiment with *Cossembazar* stockings and gloves.

“Having drawn them,” says he, “upon the wax molds, I plunged them into vessels containing the milk, which the cloth greedily absorbed. When taken out they were so completely distended by the gum in solution, that, upon becoming dry by exposure to the air, not only every thread, but every fibre of the cotton had its own distinct envelope, and in consequence was equally capable of resisting the action of fluid bodies as if of solid gum.

“This mode of giving cloth as a basis I found to

be a very great improvement; for, besides the addition of strength received by the gum, the operation was much shortened.

“ Woven substances that are to be covered with the gum, as also the molds on which they are to be placed, ought to be considerably larger than the bodies they are afterwards intended to fit; for, being much contracted from the absorption of the milk, little alteration takes place in this diminution of size, even when dry, as about one-third only of the fluid evaporates before the gum acquires its solid form.”

Mr. Howison, who seems to have engaged in these experiments with a zeal that does him much honour, observes, that of all the cloths upon which he made experiments, nankeen, from the strength and quality of its fabric, appeared the best calculated for coating with the gum. “ The method I followed (says he) in performing this, was to lay the cloth smooth upon a table, pour the milk upon it, and with a ruler to spread it equally. But should this ever be attempted on a larger scale, I would recommend the following plan: to have a cistern for holding the milk, a little broader than the cloth, to be covered with a cross-bar in the centre, which must reach under the surface of the milk, and two rollers at one end. Having filled the cistern, one end of the piece of cloth is to be passed under the bar, and through between the rollers: the former keeping the cloth immersed in the milk, the latter in pressing out what is superfluous, so that none may be lost. The cloth can be hung up at full length to dry; and the operation repeated until of whatever thickness wanted. Care must be taken that one fold does not come in contact with another while

wet; for the instant that takes place they become *inseparably* united."

From the simple recital of these experiments, a number of ideas of a very interesting nature must crowd into the mind of the discerning reader. As this gum, as our author calls it, is incapable of being melted by the heat of the sun, dissolved by rain, or sensibly affected in as far as we yet know by any of those æriform fluids which abound in our atmosphere; as there is likewise no insect that we have ever yet heard of which preys upon this substance, it seems to be better calculated to defend the fibrous parts of animals or vegetables against those injuries to which they are so everlastingly subjected when exposed to the air, than any thing else in nature. It does not indeed appear, that this substance can ever be employed simply as a varnish to defend metals or wood from the injuries of the air, because it does not adhere to smooth surfaces; but it may be employed for so many other purposes which we have never hitherto been able fully to effect, that we might easily pass from this; though under certain circumstances its beneficial effects might even be extended to them. But we shall now pass on to others of more obvious utility.

It will be recollected, that Coutchouc is so very elastic as to admit of being bent in any form without sustaining the smallest injury. Any kind of cloth, therefore, the fibres of which are covered with this impenetrable coating, may be applied to any purpose in the open air without the smallest inconvenience. Tents therefore, and every thing else of that sort, and sails of every kind, would not only be thus rendered *totally* impervious to rain or wind, but they would be

rendered at the same time, comparatively speaking, of everlasting durability, without any sensible augmentation of weight, or diminution of pliability.

Perhaps one of the greatest desiderata in Britain, is that of a cheap and durable roof to houses; and, if the poor be considered, their comforts would be more augmented by obtaining this than by any one other thing that can be named. But should the time ever arrive when this tree shall be so much cultivated as to afford the juice in abundance, the thing will be finally effected; for, were a wooden roof covered over with a coating of even the thinnest gauze, that had been filled with Coutchouc, it would be sufficient to defend it, probably for ages, against access to the smallest drop of rain from above. But I hasten to other uses more peculiarly adapted to promote the prosperity of *Britain* as a nation, than almost any other.

That our fisheries are an object of importance, even in their present state, every person will admit; and that they may be made of infinitely greater value still, no considerate person, who has bestowed attention upon that subject, can possibly deny. Whatever, therefore, tends to diminish the expence of nets and fishing lines, and at the same time to improve their quality, must greatly benefit the fisheries; but I will venture to say, that nothing that has yet entered into the mind of man to conceive could tend to effect this purpose nearly so much as the obtaining of this *beneficial* milk in abundance; which, I think, will be rendered very obvious by a few words.

If every inch of twine that is to enter into the composition of a net were to be previously dipped in the milk, and afterwards dried, it would be so effectually

defended from wet as to be nearly indestructible, in as far as respects rotting; and the very same thing applies to lines. Under this point of view, then, the saving would be very great. But farther,

In consequence of rendering the nets more durable, the owner of these nets would be enabled to be at a greater expence in the materials of which they are to be made, than he ever could do otherwise; especially if the cost of making these nets and repairing them be proportionally diminished. But that the cost of *making* nets would be thus greatly diminished, must be obvious to any one who considers that all that could be necessary for making a net would then be, first to stretch the threads of twine along an even floor in one direction parallel to each other, and at the exact distance required the one from the other, and then to stretch others, as they were drawn from the milk while yet wet, at right angles across these at the proper distances; and as these, while wet, would join quite firmly wherever they touched each other, the meshes of the net would be all thus formed at once, merely by allowing it to lie about a quarter of an hour till it dried, and the gum should be entirely consolidated. Although there is no reason to suppose that more than this could be wanted; yet, if for very strong nets it should be found that the quantity of Coutchouc at each intersection was rather less than was necessary, all that could be required would be to turn the net quite over, and then let fall a drop of the milk on each intersection, and suffer it to dry. It is obvious also, from the slightest consideration, that wherever a hole should break out in the net from any casual violence, it might be repaired after the same mode of procedure

with the utmost facility and neatness, if it were only in the owner's power to buy some of the milk whenever his situation might require it; and if it can be preserved for twelve months this could easily be done. Besides, we shall soon see that it might be otherwise obtained. These are great improvements; but the greatest improvement in this line, which we should thus be enabled to carry into practice, remains still to be noticed.

Every fisherman is sensible of the incalculable benefits that he would derive, were it in his power to render the twine, of which his nets are composed, a great deal smaller than that to which he is at present obliged to have recourse for catching strong fish, on account of the brittleness of the materials of which it is composed: and in proportion to the size of the twine, the largeness of the bumps formed by the knots must be, so that every fish that is in the least shy is immediately deterred from proceeding whenever he sees the net stretched before him. But could nets of a large mesh be formed of small twine without any knots, after the manner of one of the wheel-spider's webs (which are formed exactly as our Coutchouc nets would be) they would be scarcely perceptible, and of course would occasion little alarm to the fish. Now, as silk is known to be nearly ten times as strong as common twine of the same size; if the net were made of silk, the threads would be sufficiently strong, though of a very small size, such as would scarcely be perceptible. From these considerations, of the importance of which all our fishermen are fully sensible, nothing but the *expence* of silk nets prevents them from being universally adopted in all our fish-

eries: but were the expence of the manufacturing of nets to be thus diminished, and their durability augmented, this difficulty would be removed, so that they would soon come into universal use. For, although the first cost of the materials would not be thus lessened, yet, as one of these nets, when once obtained, would not require to be renewed for perhaps an age, it would descend like a field of land from father to son, and would be a source of certain income to the holder during the time he enjoyed it; and when he chose to part with it, it would always bring a valuable consideration.

The same reasoning obviously applies in every particular to that of fishing-lines; so that it is unnecessary to repeat it.

And, although it does not apply with such entire speciality in all its points to the manufacture of cables and cordage, because the friction to which some of these are exposed, may, perhaps, be presumed in some instances to render them more liable to being rotted; yet, as this is a matter of doubt at the best, seeing if the twine were loosely spun, so as to admit of its being soaked to the heart, it might be supposed that each separate filament would be enveloped in its distinct coating, which would prevent the rotting from ever penetrating farther than the individual fibre that was worn through, and seeing also that a rope could be thus formed without any sort of twisting, and of any form that should be best suited to the purpose required, which, by admitting of an equal strain upon each thread, would make it much stronger with the same number of threads than any twisted rope ever can be; a hempen rope might be thus rendered nearly

as strong as one of silk at present, so as thus not only to diminish the expence, but also greatly to lighten the rigging of a vessel, and thus to promote nearly as much the general interests of navigation, as the fisheries of our isle.

I could, even at this moment, point out several other material improvements that might be made in these two important departments; and, no doubt, the ingenuity of other men would be able to suggest many more that are totally beyond our present comprehension. These cursory hints, however, are enough to show, that it is an object highly deserving the attention of the public. I shall take an early opportunity to give an account of some farther experiments by Dr. Roxburgh on this subject, with the name and botanical classification of the plant that gave occasion to these remarks, accompanied by some hints for its propagation and farther extension, with a view to supply the future demands of this kingdom.

To the Readers.

A CORRESPONDENT who signs *A. C. Z.* earnestly recommends an enlargement of the agricultural department of this work, and is extremely solicitous with the Editor to proceed rapidly with (what he seems to expect) a complete system of agriculture. I should have answered this requisition very slightly had I not received many other letters of a similar tendency from various quarters since a very early period after the work commenced. This circumstance indicates that an opinion pretty generally prevails that something of that sort is, or was intended, which makes me suspect that some unguarded expression of mine must have given rise to it; although I am totally unable to conjecture where it is to be found: but, to remove all doubt on this head, it behoves me here clearly and explicitly to declare, that such an enterprise never was in contemplation by me. Any one who is acquainted with my habits of thinking on this subject, which, I imagine, may be unequivocally collected from all my agricultural writings, must, I should think, perceive that I know myself to be still at an infinite distance from that degree of knowledge which could authorise me to engage in such an undertaking. This I say, not out of false modesty, from a desire to be contradicted, with a view to flatter a little childish vanity; for I am perfectly sensible that I know a variety of particulars on that subject which many persons, who think themselves completely qualified to execute this task, and

who are restrained from doing it merely from a fear that their works might not sell, have never got a single glimpse of. Ignorance in this case, as in most others, only generates presumption; for most true it is here, as elsewhere, that

“A little learning is a dangerous thing.”

Were my own amusement, or emolument, or the affording a mere temporary entertainment to my readers the principal objects I aimed at, I doubtless could bring forward a tolerably plausible performance on that plan; for few exertions of the mind are more pleasurable than the exercise of that kind of superiority which the mere act of giving dictatorial precepts implies; and those who are not sufficiently aware of the danger that may result from indulging this propensity, may be in some sort excusable if they thus gratify their own inclination. In them it could only be called a blameable carelessness, like a child waving a firebrand while surrounded by combustibles; with regard to those who know the danger, and still persist in it, it becomes a positive crime, like wilfully setting on fire. My object then is to keep myself, as far as possible, from incurring the blame of such a serious charge. The little that I really know, compared to the immensity that I do not, is like the drop in the bucket; a mere nothing: but that little I shall communicate to the readers as occasion shall call for it; and when I do so, it shall be given with the firmness it deserves. My principal aim, however, will be not to teach others, where I require to be taught myself, but to put them in a way of informing themselves, and of becoming, in time, teachers to others where I must have failed.

In one particular respecting agriculture, however, I have reason to suspect that most of my readers, and the public in general, view the subject in a very different light from what I do. It seems to be a very universal opinion, that the practice of agriculture is to be best taught by learned writings, by harangues, by premiums, and I know not what of that sort; all of which I consider as of trifling importance. I am stunned with the sounds “ignorance of our farmers,” their obstinacy, and the necessity of putting them in leading-strings, and *driving them on to their own good*; while I know that farmers are as much alive to their own interest, and as ready to seize it when it is within their reach as any class of persons whatever. Who ever heard of the obstinacy of a shoemaker, a taylor, or a milliner, who would not adopt a new fashion? Nobody. And why? Because they find it would be much contrary to their interest to do so. And do they not exercise their ingenuity in discovering novelties, for the same reason? Are farmers then to be accounted a singular exception to all rules? No. But those who think they can be made to go forward by any other incitement than that which stimulates all other men, that is, a freedom to act in the manner they know will best promote their own interest, and a certainty that they shall be secured in the possession of what their ingenuity and industry shall acquire, will doubtless find themselves mistaken. If a man feels he has ingenuity, Will he not fly to that profession where this ingenuity can be turned to the best account for himself and his family? If he has the spirit of a MAN, which disdains to be the tool of any human being, Will he not wish to be placed in a situation where himself and family will not be in danger of being turned out of house and home, when they are perhaps in the most helpless situation; or oppressed by infinite harassments at the whim of another? If he has an active spirit of industry, with a small capital, Will he not choose to get into that line where that industry will have the best chance of raising him soonest to a desirable competency; or where the small capital can produce a competent in-

come, with the greatest certainty or ease? Can a farmer, I ask, without a lease, or whose lease approaches to a close, be said to be independent? Can a farmer, whose hands are tied up by restrictive clauses that have been dictated by ignorance, exert his ingenuity with energy? Can a poor farmer, be he ever so active, honest, and industrious, be able to live as well, or raise his family into as respectable a situation as in many other *professions* in this country? Can a farmer with a small capital, or no capital at all, ever hope to raise himself to the same exaltation of wealth, or consequence, as thousands of citizens in London, who were a few years ago in his situation, now enjoy? If none of these questions can be answered in the affirmative, Why do you talk of inciting farmers to act by giving them precepts upon precepts, and lessons heaped above lessons a hundred fold. It is neither by skill in their profession, nor vigour of exertion, that such men in general can raise themselves; but by the practice of the mean arts of chicanery and evasion; of shuffling and cringing, and of cheating those who expect to impose upon them, that they are to get forward; and, as their interest is here deeply at stake, you need not doubt but their ingenuity will be exerted, and that they will find little difficulty in biting those who expect to profit by their simplicity. In a country thus circumstanced the profession of agriculture must be degraded; and in spite of the example of a few, and the inconsiderate zeal of the many, that country must be poorly cultivated; and dependance upon foreign nations for the necessaries of life must follow, though treatises on agriculture so much there abounded, as that the soil might be manured with them.

No one thing that I know places the weakness of the human understanding in such a striking point of view, as the perpetual propensity that men, even those of the most respectable talents, have to *decide* upon subjects that they never have had an opportunity of fully investigating. To hear persons in this situation talk of the utmost physical possible productibility of a country, without adverting to the over-ruling influence of *moral* causes, is like one who should decide upon the expansile power of the air from a single experiment, without adverting to the variation that would take place in consequence of an augmentation or diminution of its heat. Spain, with a population of about eight millions only, is at the present moment distressed for want of food, and can scarcely subsist its inhabitants in an ordinary year. The same Spain, under Ferdinand and Isabella, sustained a population of above twenty-five millions, and had abundance, and to spare. Is it from any physical variation in that country that this difference arises? I myself know in this island a district which, at the present moment, supports at least AN HUNDRED times the number of people it could do thirty years ago. These are facts which are either not known or not adverted to by those who pretend to ascertain the utmost possible extent of the produce of this country. Sensible men ought not thus to intrude upon the province of fools. *Ne tutor ultra crepidam* applies to more businesses than that of a cobbler. Knowing these things as I do, can I, if I seriously wish to promote the real interests of agriculture, and the general prosperity of this country, suffer myself to be carried away like an idle boy in chase of the brilliant though unsubstantial colours of the rainbow, which never can be attained, while the only objects of real importance are disregarded? I shall discharge the task I have undertaken with the utmost fidelity in my power, by dwelling chiefly upon those particulars that have the prospect of proving ultimately the most beneficial to the public, as far as my own judgment goes.

14.

APRIL 1800.

RECREATIONS
IN
AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 2. VOL. III.

AGRICULTURE.

Hints respecting the circumstances that require to be chiefly adverted to in experimental agriculture, particularly with a view to a proposal for instituting a national experimental farm.

[Continued from page 17.]

2nd. *Varieties of the bos tribe respecting size.*

THE diversities of this tribe, in as far as respects the size of body, is not nearly so great as in some other classes of animals, the dog species in particular; but I shall be able to show that they differ from each other much more in regard to this particular than has been in general suspected.

VOL. III.

G

82 *Varieties of the bos tribe respecting size—Arnee.*

The urus, which was formerly a native of this island and of Ireland, as appears by the horns of vast magnitude of this animal that have been found at various times in the mosses and bogs of these countries, was, doubtless, the largest creature of the ox kind that was ever found in Europe; but the breed has been extinct in this country for time immemorial: no records mention it as being alive here at the time they were written; nor should we know that it ever had been a native of this country were it not for these its indubitable remains. This breed of cattle still subsists in the Polish province of Lithuania, and is represented as much larger than any other European breed; but it would not seem to be a favourite there, as it does not appear to gain ground. I have not been able to collect any satisfactory particulars respecting this animal.

But the largest breed of cattle hitherto discovered is found in the interior parts of India, where it is known by the name of *Arnee*. It is indeed one of the largest quadrupeds found on this globe; and may, perhaps, in some cases dispute the palm in point of size, though not of sagacity, with the elephant itself. The following are all the authentic particulars that I have been able to collect concerning this huge creature.

About the year 1790 or 1791, the Hawkesbury East Indiaman, on her voyage outward, while she was going up the river Ganges, and at the distance of about fifty miles below Calcutta, fell in with a bullock of this species floating in the river, and still alive. A boat was immediately hoisted out, which went in chase of this game: a noose was soon thrown across the horns; and it was then dragged to the ship's side, hoisted on

board, killed, cut up, and soon after dressed for the use of the ship's company, who found it a most delicate morsel; being the first fresh meal that they had tasted for many months. They all thought it a very large sized ox, and were the more surprised at this particular when it was discovered to be only two years old. When cut up, it was found to weigh three hundred and sixty pounds per quarter, making one thousand four hundred and forty pounds of beef in the whole carcase. As this animal must necessarily be supposed to be lean at the time, for it must have floated, in all probability, many hundred miles down the river (none of this breed being found lower than about Plafsy), and must therefore have fallen off in flesh very much, we cannot compute that a full sized bullock of that breed, when thoroughly fatted, could have been less than three times that weight; so that the four quarters alone would have amounted to two tons; an enormous size for an animal of this kind.

Mr. William Haig, who was at that time first officer of the Hawkesbury, and an attentive observer of nature, was so much struck with the magnitude of its size, and the singularity of its appearance in other respects, that he caused the bones of the head and the horns to be preserved, and sent to his brother, Mr. James Haig of Edinburgh, in whose possession they now are, and where I had an opportunity of observing them at leisure: but I think it unnecessary to enter here into a detailed description of them; it is enough simply to remark, that, instead of being nearly circular, as a section of the horn of our common bullock is, a section of this horn more nearly approaches a

triangular form, bearing *in this respect* (though in this respect alone) a faint resemblance to the sheep's horn. Upon it there appeared some external rugosities, especially towards the root of the horn; but no circular rings indicative of the age, as in our cattle. The horn too, in proportion to its size, is much thinner and lighter than those of European cattle.

In consequence of having my attention thus strongly directed towards this subject, I was at some pains to make inquiry of gentlemen who had been in India respecting cattle of a large size in that part of the world. Some of them mentioned animals of this kind, which they said were kept by the native princes chiefly for parade, as elephants are, under the name of fighting bullocks. Though I have met with no indications, that this is either a ferocious or a warlike creature, yet I met with a very convincing proof that such a breed of large bullocks are kept by some of the native princes, probably for parade; for three of these creatures were very distinctly delineated in a painting done in India representing one of those entertainments that are given by Indian princes for the amusement of their subjects, similar to those fights between strange animals that were exhibited for the same purpose on the arena of ancient Rome. It was an elephant contending against two tigers; in which the attitude of the combatants was expressed with great spirit and a strong semblance of nature. Among the number of objects that were there assembled, the three cattle of which I speak appeared, as if waiting apart, each under the guidance of his leader, who was seated upon his back, as is represented in the figure annexed, which was

done from a correct drawing made from the picture itself, by permission of Gilbert Innes, Esq. of Stow, Edinburgh, to whom it belonged. These cattle are said to be twelve, and sometimes fourteen feet high; but if the rider on this one be considered as a scale, it would seem not to have attained quite so great a size. Something however may, perhaps, be allowed for the exaggeration occasioned by the surprise of seeing a bullock so much beyond its usual stature.

The horns of all the three cattle of this sort seen in the painting, as well as that on the skull in the possession of Mr. Haig, rose upwards nearly in the same plane with the face; they all spread outwards immediately after springing from the head, and, bending first upwards, they gradually turned inwards, so as to approach each other nearly in a circular form; but those belonging to Mr. Haig had not yet attained the age to begin to turn inwards. In all these particulars they seem to be the same animal: but those in the picture are all represented as being of a circular form also, and not at all angular, if cut across. This we might easily conceive to have arisen from the negligence of the painter; and I should have had no doubt of it, had I not found a pair of horns in the possession of Dr. Walker of Edinburgh, which were brought from India, and which in all respects correspond with those exhibited in the painting, having neither the angles nor the rugosities that are so conspicuous on those of Mr. Haig's. The skeleton of the head in his possession is also much longer and thinner in its proportions; and what we should deem of a far more elegant shape than those in the painting. From these

considerations I am induced to believe, that there exist in India two distinct varieties of the bos tribe, which are of a magnitude that far exceeds any of the same class that are found in Europe, and concerning which I shall be glad to receive farther elucidations.

As to the rest, the animals in the painting are evidently very docile, and quite tame. The colour in all the three is a pure black, without the smallest spot of any other colour, unless it be one tuft of longish hair upon the forehead directly between the horns, which is of a bright red colour.

This is the largest breed of cattle that I have yet heard of. The smallest that has come to my knowledge, I never yet saw; but it has been so accurately described to me by several persons who have seen and handled it often, that there can be no possibility of entertaining a doubt that such a breed of cattle does actually exist; and it may perhaps be deemed as great a curiosity as the former, and as worthy of a particular investigation of its qualities. The diminutive creature to which I here allude was a bull, which, with a cow of the same breed, was brought by way of natural curiosity from some part of the western coast of Africa, as my information goes, with a view to be presented to the late duke of Northumberland; but, unfortunately, the cow received a hurt on board the vessel, which caused her death. The bull came safe, and lived about Sion house, near Brentford, above eight years, being quite domesticated, and as tame as a dog. Mr. Forsyth, at Kensington, who was then gardener to the duke, assures me, that he has measured him often after he had attained his fullest size, and when

he was enormously fat; and that from the ground to the top of the shoulder was precisely two feet. He was a neat, well-formed, and beautiful creature of his kind. His horns would seem to have been rather longer and finer than those of the ordinary bulls in this country, being three or four inches long, and very sharp. Like all other *pets*, he became very familiar in the family. He used to accompany the brewer to the cellar, and came at last to relish a horn of good ale very well; and, after having satisfied himself completely, he used to take his place before the hearth in the servants' hall, from which it was not an easy matter to dislodge him. He became at length a little mischievous and troublesome to strangers who came about the house, by some of whom, it was supposed, he had been so severely beaten as to occasion his death at last; and great was the lamentation for poor *Tom* (for so he was called) on that occasion.

I do not find that any portrait or drawing was ever made of this creature, nor have I been able to learn from what particular part of the coast of Africa he came. He was of too small a size to be able to leave any progeny behind him, unless some pains had been taken for that purpose, which I have no reason to believe was ever attempted; so that we can know nothing either of the good or the bad qualities of that variety of cattle, nor any thing farther than what respects its size alone.

I observed, not many months ago, a paragraph in a newspaper, intimating that a cow had been presented by a captain of a ship to a gentleman, I think in the west of England, which measured only three

feet in height. If so, and if the cow was full grown, it must be another breed of diminutive cattle, but much larger than the former. Should this fall into the hands of any person who knows more of this creature, particular information respecting it will be taken as a favour.

Another small breed of cattle was brought from India about twenty years ago by captain Dundas, which were kept by him for many years at his seat called Money-hill in Hertfordshire, where they bred, and prospered as well as in their native country. What has become of them since his death I know not; nor do I know that any pains were taken for ascertaining their comparative merits in any respect with other breeds. I have only understood, that, as in India, they were found to afford here a very considerable quantity of milk, which is one proof, among many, that the small quantity of milk in India is not to be solely attributed to the soil or climate.

The smallest breed of cows I have yet seen, that are natives of Europe, is that which is called the Guernsey cattle, of which we shall have occasion to speak more fully hereafter. The Highland breed of cattle, commonly called *kiloe* in England, is also much below the size of the usual breed of cattle in England; and some of them are of very beautiful forms. Larger than these, and perhaps still more elegant in their form, are the Devonshire cattle. The Lancashire are, I believe, still superior in size, and the Leicester above these; but I believe the largest in size that are found in this island are some of the varieties of the Dutch or Holdernefs breed. On this

head, however, I wish not to be understood to speak decisively. In short, it is no part of my plan to enter into a critical disquisition upon this subject on the present occasion. What I mean chiefly to establish is, that there are different breeds of cattle, which in point of *size*, as well as other qualities, vary greatly from each other; and that this depends upon the breed, and not upon the accidents of climate, food, &c. as has been too often supposed.

The plain inference then that I wish to draw from this fact is, that if the breeds be really and truly different, they may vary from each other in many of their less obvious qualities, as much as they differ from each other in respect to size; and that, therefore, it is of much importance to the community, that these qualities in each distinct breed should be fully ascertained by fair and accurate experiment. The following illustration I should hope might tend to show the utility of such an investigation.

It is not at all uncommon to hear agriculturists arguing about the propriety of consuming the produce of their fields with large or with small cattle; and on such occasions arguments of the following kind are often adduced. If three cattle of thirty stone weight each consume only as much food as two of forty-five stone weight each, will it not be equally profitable to the farmer to consume it with the three small as with the two large beasts? Now, without entering into the merits of the question at present, I mean only to say, that the mere statement of the question shows, that the mind of the person who proposes it, as well as that of him who assents to it, has been under the in-

fluence of an impression that may prove extremely fallacious: for it is evident, that both of them take it for granted, that the same quantity of food will go equally far in nourishing both breeds in proportion to their bulk of carcase; for on no other supposition could the argument be accounted good for any thing.

But since it is a well known fact, that different breeds of animals of the same class will require very different quantities of food to produce the same weight of flesh equally fat and juicy; and as one of these breeds may be of a larger size than the other; it would be a very fallacious mode of reasoning indeed to say, that because such a field can nourish two beasts of a particular breed that weigh forty-five stone, it will equally well nourish three of another breed that weigh only thirty stone each; and that therefore it is a matter of indifference which may be preferred: because, for aught that yet appears, it may so happen, that the field that could sustain no more than two beasts of forty-five stone each may perhaps be sufficient to rear not three only, but five or six, possibly even more, of thirty stone each, or *vice versa*. To give an example: take a mastiff, a greyhound, and a shock dog, whose weights are respectively sixty, thirty, and fifteen pounds each. If I have been rightly informed, the quantity of food required to keep these dogs in good condition would be, nearly, for the mastiff, one pound; for the greyhound one pound; for the shock dog three ounces, a day. Of course, one hundred pounds of food would nourish of mastiff flesh six thousand pounds; of the greyhound ditto three thousand pounds; of the shock dog ditto about eight thousand pounds; so that the

lofs in employing the second, when compared with the first, would be as two to one; and that of employing the second, when compared with the third, would be as two and three-fourths to one nearly.

The above statement is not given as being absolutely accurate, but merely as illustrative. And as something of the same kind, though not perhaps to an equal degree, takes place between different breeds of cattle as of dogs, it is not a matter of such simple calculation as it has been usually supposed, to ascertain whether it will be the most beneficial in a particular case to adopt a large or a small breed of cattle. It is, indeed, impossible that it ever can be done in that general lumping way; for, if ever the real qualities of different breeds shall come to be accurately ascertained, it will, doubtless, be found, that they vary in regard to so many particulars, that perhaps no one rule can ever be made general, because, from the peculiarities of the case and the nature of the circumstances, it may sometimes happen that a large breed may be preferable to a small one, or *vice versa*; and that, by a very small variation of circumstances, the case may be reversed. But if two breeds could be found that were equal in all respects, there are many circumstances in which the small would be preferable to the large.

In the first place, a small animal, if put upon pasture fields where the surface is a little soft, will be more easily supported than one of larger weight, and not be so apt to poach it. What a difference there would be in this respect between an *Arnee* of the weight of four tons or upwards, and a *Tom* that

would not perhaps exceed an hundred pounds! The latter too could find an abundant bite and sufficient food to fill its belly upon a much barer pasture than the former.

In the second place, there are innumerable situations in which small beast will be much better suited to the accommodation of a family than a larger, or in which it would be more desirable to have three or four instead of one. Many a poor person would have abundance of food for a *Tom* cow, who could not possibly maintain one of a larger size; and the quantity of milk that such a cow would yield may be exactly suited to the wants of the family, where a larger quantity would only prove distressful. Persons in moderate circumstances too, where the risk is divided, are much less in danger of being thrown into distress by deaths, than they would be if all were in one; and, as the cows may calve at different times, they are less in danger of being totally deprived of that useful article at one time, and of having it in too great quantity at another. The supply becomes more equal; they never experience either superfluity or want. In like manner, a family that lives in the country, if it be moderately large, can easily consume a *small* beast of their own killing, whereas a large one proves distressful to them; one half of it must be eaten before it is fit for use, or a great part of it must be thrown away as being tainted. Every person in such circumstances must know, that three or four small beasts would be, to them, of more than twice the value of one that was equal to them in weight.

Lastly, small beasts will always find a ready mar-

ket, and will usually bring a higher price in proportion to their weight, than large. The very reasons already assigned bring more purchasers. Is it for milk? How many more can reach the price of a small cow than a large one! Is it for rearing? How many have keep for a small one, that could not have it for one of a large size! Is it fat, and for the butcher? Perhaps in Smithfield market it may make little difference; but in other places there are many who will choose the small in preference to the large. All this is on the supposition that the meat is of an equal quality in both cases; but if it should happen, that the small meat is also finer and more delicate than the large, the difference in its favour would be still more considerable.

From these considerations it appears, that the mere size of a breed of cattle is not a matter of indifference; and particularly, that those of a diminutive size ought not to be rejected with contempt, as they too often seem to be. They ought rather to have their qualities carefully investigated; because, as we have evidence in the dog species, that some small kinds possess excellent qualities which cannot be found in any that are of a larger size, it may so happen, that similar valuable qualities may be found to peculiarise some of the smaller breeds of cattle. They, therefore, deserve our particular attention; for if any of them shall be found to be truly valuable, they will tend more to augment the comforts of those who are among the most helpless individuals of the community than any other, while they may at the same time add to the luxurious dainties with which the tables of the rich, though plentifully loaded, are not yet by them deemed to superabound.

3rd. *Varieties of Cattle respecting milk.*

The diversities that take place between different breeds of cattle in regard to milk are very great, not only as to the quantity in proportion to the size, but to the quality also of that milk in different varieties. The *richest* milk yet known in Europe is afforded by a small breed of cows that are natives of Alderney, and some other small islands off the coast of France. These cows constitute a remarkable variety in several other respects. The body is thin, the legs fine and sinewy, and the creature throughout its whole appearance as much resembles a deer as an ox. Experiments are wanted, not only to ascertain with precision the peculiar qualities of this milk, but the average relative proportions between that and the weight of the animal. In doing this, an opportunity would be given to mark with precision the variations that take place in this respect between different individuals of the same breed, which, if once begun, would lead to a long train of important discoveries.

Perhaps, of all the cattle which are reared in this island, that which approaches the nearest to the Alderney in point of richness of milk, is the Highland, or *Killoe* breed, as it is usually called. This breed, as well as that of Alderney, is of a small size, but very different from it in its shape and general appearance. Many are the varieties of this breed; and some of them seem to possess qualities that well deserve to be fairly ascertained by accurate experiments. Some individuals of this kind that have fallen under my own particular observation, not only afforded rich milk in very large quantities in proportion to their size, but

possessed the quality of fattening also in a very eminent degree. I had once a cow of a mixed blood of this sort, which not only yielded an unusual *quantity* of very rich milk, but that generally for about eleven months in the year. This cow, which I kept till she was ten years old, was at all times in much better condition than the other cows which were kept along with her, and equally well fed; and her descendants retained the same quality as long as I kept them, which was for several generations, and as long as I kept cows of any sort. This fact I wish to be generally known, as it affords one evidence at least that several valuable qualities may be found united in the same animal; some others will incidentally occur. Indeed, I have no reason to believe, at the present moment, from all the observations I have been able to make, that there is any foundation for the opinion, which, I fear, is too general, that if a beast possesses one good quality in an eminent degree, it necessarily presupposes that it must be inferior to other breeds in other respects. Most people suppose, that if a cow gives a great quantity of milk, it must be thin, and if she gives much milk, she must be a poor feeder. The fact just stated, and many others that have occurred to me (and I appeal to the reader, if he has had much experience in this respect, after he has taken a retrospective view of his own experience, if it does not confirm the remark), give good reason to suspect that the rule is unfounded; and that if some instances concur with it (which doubtless does happen) these can be considered as coincidences merely *casual*, and not *necessary*. Experiments tending to

set this point in a clear light must surely be deemed of primary importance.

On this subject allow me to mention, that a selection of this (the Highland) breed of cattle had been made many years ago by Mr. Farquharson of Invercauld, a gentleman in the higher parts of Aberdeenshire, that have been kept by him ever since for the purposes of the dairy chiefly, which have given great satisfaction in that respect, and are found at the same time to fatten very early at all ages. These were once crossed with the Falkland or Fifeshire breed (which, though tolerable cattle, are by no means valued for their milk), yet the descendants of these afford a large quantity of milk in proportion to their size, which is also of a very rich quality. One of these small cows will yield during the summer season between eight and nine Scotch pints of milk (about four gallons and a half English) in the day, the cream of which being separated and churned will afford one pound and from ten to twelve ounces of butter avoirdupoise weight.

If we try to investigate the qualities of the other breeds of cows that have become conspicuous in this island, and endeavour to ascertain their comparative merits as to milk, we meet with nothing but vague opinions respecting unascertained facts. It seems to be pretty generally admitted that the Dutch short-horned or Holdernefs breed of cows yield more milk than any others, though it is as generally admitted that the milk of these cows is of a very thin quality. I have met with no facts, however, that afford decisive proofs of either of these positions. This breed

of cattle, unless it be for milk only, is perhaps inferior to most kinds of cattle reared in this island: nor is it at all clear to me, that even in respect to milk there are not other breeds that equal if not exceed them. The quantity of milk that one of those cows yields in a day, for a short time after calving, while on the top of the grass, is indeed very large. In these circumstances I have known a single cow yield *eight* gallons (English) of milk a day: but it must be recollected that these are among the largest sized cattle reared in this island, and that they continue only for a month or two after calving to yield that very large quantity of milk, after which time it usually diminishes very much. The little cow I mentioned above that belonged to myself, though she was not above half the size of one of those, yielded sometimes about seven gallons of milk soon after calving, and when properly fed would perhaps have yielded about five gallons a day on an average for eleven months in the year (for she would have given milk at all times till the day of her calving, if she had been milked till then). This is perhaps more milk than any Holdernefs cow has been known to yield during the whole year, though there is not a doubt that half the quantity of food would have sustained her. Were I here to state the quantity of butter that milk would have yielded, compared to what the same quantity of some of the thinnest Holdernefs milk would yield, the difference would be still more striking; but, as I am far from thinking thinness of milk has been proved to be an *invariable* property of this breed, I decline to make this point of the parallel.

The Suffolk cows are deemed good milkers. The Lancashire or long-horned breed are thought to be only indifferent in this respect. The Devonshire cattle, though beautiful and valuable in other respects, are not well known as milkers. In short, unless it be the solitary experiment by Mr. Farquharson above quoted, I have not heard of a single attempt having been made in this island to improve the breed of dairy cows: for in the principal dairy counties such kinds only are bought by the farmer to keep up his stock as chance brings to his hand. On this subject there is such a confused train of indistinct ideas afloat in the minds of men, that it will be long before they can be brought in any way to think consistently upon it, or, of course, to make any experiments that tend to profit; though I can fairly say, from the facts that have fallen under my own view, that there is no branch of rural economy that is susceptible of greater improvements than that of breeding cattle for the purposes of the dairy.

If we are, in this respect, unacquainted with the qualities of the cattle that are fed in our own stalls, it will not be expected that we can know any thing with precision respecting those of distant countries. There seems, however, good reason to suspect that none of the varieties of the bos tribe yield nearly so much milk as the common kind that is generally domesticated in Europe. The buffalo, which is sometimes tamed in the higher parts of Germany, is said to yield very little milk in proportion to its size. In the East Indies the cows, which are generally of the Bison class, from the best information I can get, are found in ge-

neral to yield not more than an English quart a day: nor have I met with any fact that seems to give an advantageous idea of the milking quality of any variety of the cow kind that is not found in Europe. The Yak, it would seem, is more valued for its milk in India than any other known breed; but here, as usual, we are in the region of uncertainty only, and accurate experiments are wanting to ascertain the necessary facts.

As it may afford an agreeable diversity to the readers, however, I shall introduce in the next number some practical remarks on the management of the dairy, being the result of experience.

[*To be continued.*]



The Arnee, the largest breed of cattle yet known.

NATURAL HISTORY.

On the transformations, &c. of Insects.

[Continued from page 36.]

Of the Formica-Leo, or Lion Ant.

THE diversities of nature are infinite; and in no particular are they more so, than in what respects the habitudes and modes of living of the larvæ of insects. In our last, we had occasion to bring under review an aquatic insect, which, though it inhabits the water for the greatest part of its life, differs from fishes in general, in being in no respect carnivorous. It belongs rather to a class of animals that has been so little observed, as not to have obtained a distinctive name, but which might perhaps be called *terrivorous*. The insect that at present attracts our notice, though like the Ephemera it is in its perfect state a fly with four wings, produces a progeny which, in its larva state, seeks shelter in the earth, not for the sake of consuming that substance as food, but for employing it as a trap, by a device of a most singular kind peculiarly its own, for ensnaring other insects, and for concealing itself from their view until they shall be brought within its grasp, when it seizes them with an unrelenting gripe, and devours them with a voracious avidity.

This insect, on account of the peculiarity of its manners and the singularity of its form, not less than its longevity in that form (about two years), has attracted much more notice in its *larvæ* than in its *pupa* state; so that the animal, like the silk-worm, still retains the name which it had obtained in that state perhaps

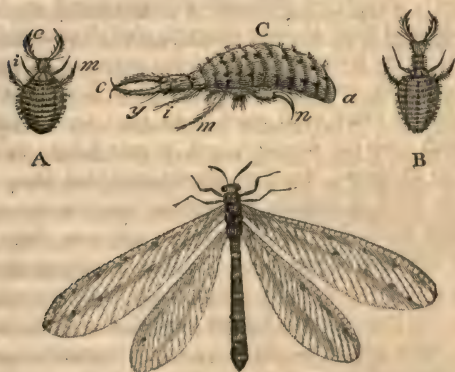
before it was known that it ever assumed a winged form; for while it is an inhabitant of the earth, as its traps are more peculiarly calculated for ensnaring ants than any other game, and as it seizes them with a firmness of grasp similar to that of the lion with its prey, from whence they scarcely ever escape, it has been called *Formica-Leo*, but in English *lion ant*, which is as much as to say, the lion, or devourer of ants; but its manners are in other respects so little analogous to that of the lion, that some naturalists have objected to the name: that, however, is of little consequence.

The form of this insect is singular, and peculiarly adapted to the mode of life that nature intended it should follow. Its abdomen is very large, resembling in a small degree that of some kinds of spiders; but it is divided into eleven rings, each of which supports a series of tubercles, from which proceed a few short stiff hairs, that appear very conspicuous when examined by a lens. Its head is flat, and of a sort of triangular form. From the two upper angles are protruded a pair of moveable organs of singular power, which in certain points bear a strong resemblance to the horns of quadrupeds. They are thickest at the base, and taper toward the point where they bend inwards. The animal has a power to move these members so as to close them like a forceps, and even to make the points cross each other at pleasure. These organs answer the purpose, not only of seizing its prey, as do the paws of the lion, but they also serve as an organ for conveying food to the stomach, like the proboscis of the gnat and several other insects; for this creature has no mouth properly so called, nor

teeth, nor other organs usually connected with it. Close by the root of these horns, in a kind of projecting knob, is placed a pair of eyes of great brilliancy. Each of these eyes, though they appear to be one only to the naked eye, are discovered by the microscope to consist of six round eyes. The head is connected with the corcelet by means of a neck or thorax of a singular conformation. Like its horns, this organ also admits of movements of an uncommon kind. It can be lengthened to a considerable degree, or shortened so as totally to disappear, at the pleasure of the animal, nearly after the same manner, to appearance, as a pocket telescope can be lengthened or shortened. The creature is provided with six legs, like many other insects; but their articulations are so disposed, that it cannot move forward, but must of necessity, when it changes place, move backward. From this conformation of body its habits would seem to have been formed, if we were to suppose that these habits had been the result of reasoning. To speak more philosophically, however, it behoves us to say, that it has been endowed with such instinctive propensities, as enables it to employ all these peculiarities of conformation in a most wonderful manner to provide for its own subsistence.

That the reader may be able to form a more distinct notion of this singular creature, it is represented in the figure page 103 at A in its natural size, as viewed from above, with its neck contracted, and at B with its neck stretched to its full length; in which figures *c* is the horns, *y* a pair of very fine antennæ that spring out below the horns and immediately above the knob in which the eye is placed, *i* the foremost pair of legs,

which are short, *m* the second pair, which are longer. The third pair of legs are under the body, and not seen in these figures, but appear in their natural position on the side view which is given of the same insect magnified to about double its size at C, in which the same letters refer to the same objects as above, *n* being one of the hinder legs. The horns here are represented as if crossed,



The Formica-Leo, or Lion Ant.

As it has been destined to live entirely upon animal food, and is totally incapacitated from pursuing its prey by speed of foot, it was necessary that it should provide its sustenance by means of wiles; and the contrivance by which nature has directed it to apply

its powers with effect for that purpose is of a sort that has greatly excited the wonder of all who have contemplated it. It always chooses for its place of abode a dry incoherent sand. In this it forms a circular cavity of a funnel-shape, highest at the rim, and deepest in the middle. This is made as deep as the sand will admit of without running down. When all is finished, our little animal buries itself in the centre, the whole of the body and every thing else being concealed, except the horn-like forceps, which are left wide open ready to seize the prey, and its eyes at the base of the horns, which just peep out above the surface of the sand. In this position it lies patiently upon the watch until some game shall unwarily encroach upon her domains; and, as ants delight in similar situations, these are oftener entrapped than any other kind of animal; though our voracious watcher rejects none that she can master; not even those of her own species, which she devours as readily as others when they fall into her snare. Whenever a careless Rambler gets over the highest mound, the sand upon the inner side of the declivity, being extremely loose, it usually slips down so far along with the creature. Should the ant tumble to the bottom, it is instantly seized by the forceps, whose sharp points, if it be not of too large a size, pierce quite through and through the body, and so effectually transfix it that all struggle is very quickly at an end; but should the falling creature stop by the way, it instantly endeavours to recover itself, and tries to regain the summit by climbing up the sides of the funnel as quickly as it can. But no sooner does the hunter observe this, than it

loads its head with sand, and throws it up with a jerk of its neck, so as to make it fall in a shower above the poor struggling insect; and this operation is so quickly repeated, and reiterated so long, that it seldom fails to overpower the struggler and to bring it to the bottom, where it is seized, and deliberately devoured: I say devoured, though this term cannot be applied in its strictest sense; for the carcase remains entire, and retains nearly its original form after all its juices have been drained from it; and so completely is this done, that the solid parts are rendered quite dry before it parts with them; so that, if no other game presents itself in the meanwhile, the carcase may be easily reduced to powder by the fingers before it be rejected. When it is perfectly drained, the satiated hunter, with one vigorous jerk, throws it far beyond the utmost verge of its funnel. He then repairs whatever damage the funnel may have sustained in the struggle, and patiently resumes his former station.

It is surprising to see what strength this little creature discovers in its struggles with its prey. In these contests the large swell of the body, being buried under the sand, gives it a firm hold of the earth, so that it cannot be easily dragged from thence by force. For experiment's sake, a large bee deprived of its wings was put into one of these traps; it was instantly seized by means of the horns; the struggle was very hard, and long continued; but the *formica-leo*, by repeatedly raising it up, and knocking it down with great violence upon the ground, at length succeeded in totally overcoming the bee, which seemed at the first to be of twice its strength.

Such is the undeviating occupation of this little insect when its funnel is in complete order. But as it increases in size, the diameter of its trap must be augmented; and after a certain length of time the funnel itself becomes so much deranged, that it is finally abandoned, and a new one must be formed in its stead. This is an herculean labour; but insects in general are so industrious, that no *necessary* labour seems ever to be burdensome: nor is the *Formica-leo* an exception to this rule. After having fixed on a proper spot, among the lightest and driest sand that it can find, it begins by describing a circle as wide as it intends the outer rim of its funnel should be. This it does with great exactness, moving backwards all the time (with its body in the position as at C), as a gardener when digging, and working busily the whole way as it goes, throwing the sand always to the outer side of the circle that it is describing. The principal tool it makes use of for this purpose is its flat head, which it loads with one of its fore legs, employed on this occasion as an arm. No sooner is the load thus placed upon the flat forehead, than it is thrown by a jerk of the neck to the place intended. It is instantly reloaded and discharged with amazing rapidity, and unceasing assiduity. In this procedure, the arm that is next the centre is alone employed for the purpose of loading; and in this way our artist proceeds till he has completed the circle. When he has done so, he reverses his position, and, continuing always to load from the side next the centre, he thus changes hands, so that the arm which was before employed now gets a rest; and thus he proceeds till he has made another.

turn of the circle, when he changes once more; and so on, always lessening the central heap, and deepening the cup as he goes on, until he has completely finished the excavation, and formed his snare to his mind, when he resumes his station in the centre, and takes his rest. I have said, that this creature from time to time reverses his position, so as to have at one time his right, and at another time his left side to the central heap; but he does not effect this by turning his body round, as might be expected. To turn round seems to be a very difficult movement for this creature; to avoid which, when it means to change its position, it traverses the heap of sand in the centre, and begins at the side opposite to that where it was; assuming the position it means to take as it approaches the circle.

But in the progress of his operations this insect is not on all occasions so fortunate as in the instance above described. He frequently meets with clods in the soil, or small stones that cannot be removed in his usual way, but which require from him much greater exertions of power; nor does he ever shrink from the attempt until he finds that his utmost exertions prove altogether fruitless. On these occasions he insinuates his body beneath the stone, and, having by degrees got it placed upon his back, he balances it with the greatest niceness, and then, moving gently backwards, shoves it by degrees till he has reached the top; and he has no sooner got it beyond the verge of his funnel, than he there deposits it, and returns to his labour. Frequently, however, in spite of all his care and cautious movements, it is impossible to prevent it from

tumbling off his back, and falling to the bottom. In that case he does not soon give over the attempt; he begins his labour anew, and pushes it slowly towards the top. Should it again tumble off, he follows it; and so on, he has been known, like Sisyphus, to push it up-hill once more, no less than six times: but, if he finds the stone too large to be moved, or if it falls back too often, despairing of being able to effect its removal, he at last is forced to abandon the hole entirely, and begin a new one; if it should chance, however, to stop before it reaches the bottom, he sometimes allows it to remain there, and uses his imperfect funnel for a time, until he recovers fresh strength to begin a new one.

These funnels are of different sizes, from about six inches diameter down to half an inch, according to the age and strength of the operator. Sometimes these cavities are executed with amazing rapidity, and at other times the work goes on much more slowly, which is probably occasioned by the animal being more or less pressed with hunger. It is sometimes completely finished in a quarter of an hour, and sometimes it will be protracted to the space of three hours or upwards. The depth is usually about two-thirds of the diameter, so that if the extreme width be six inches, the depth is about four.

How long this insect exists in its present form, or how often it changes its skin before it attains its full size, have not been ascertained. Probably it lives thus nearly two years; for they are to be found at all seasons of a great diversity of sizes. When it first issues from the egg it is extremely small; but it begins at

once to form a funnel for itself proportioned to its size, some of which do not exceed half an inch in diameter; but it proceeds in the same regular manner, and performs all its operations at the very first with the same accuracy and precision as when it has attained its fullest size.

Like most other carnivorous animals, this little creature is endowed with a prodigious power of abstinence, and can take in at one time a most enormous meal. Sometimes a spider, or large fly, equal in size to the hunter himself, falls into his toils. On these occasions the voracious little creature gorges itself with its superabundant meal, and never quits it, nor seems to desist from sucking, until it be completely drained of all its juices. After such a meal the body of the *Formica-leo* is distended to a monstrous size, and long rest seems to be unavoidably necessary. On the other hand, should it be unsuccessful for a long while it bears it with patience, and does not exhibit any symptoms of extreme uneasiness. For the sake of experiment, Mr. Poupart put one of these into a wooden box, with some proper sand, and covered it with a glass, so as to exclude access to every other insect. Here it formed its cone, and watched as usual for prey, though in vain. Thus he kept it for several months, while in an adjoining box he kept another of the same species, which he supplied with food by giving it ants and flies pretty regularly. He could perceive no difference between the movements or actions of the two; but when he took them from their holes, he found the abdomen of that one which had received no food was shrunk into a very diminutive

size, while the other retained its usual shape. It is probable that this insect reposes like the bear, without requiring any food during the winter season. Mr. De la Hire, who probably was the first person that had taken notice of the singular habits of this insect, remarks that it had passed seven months in the winter season without taking any kind of food.

One other peculiarity discriminates this insect from most other animals. Although its appetite is keen, and it takes abundance of food when it can find it, no part of that food is ever ejected in the form of excrement; nor is there any anus provided for that purpose. As it sucks in only animal juices, rejecting all the grosser parts of the body, it would seem that these are sufficiently elaborated to be fitted for being directly absorbed into the system, as chyle is with the larger animals, nothing ever going off but through the pores of the skin by insensible perspiration, and for the purpose of forming a case for the chrysalis. It never uses water, or any other fluid but the juices of its prey alone: neither can it ever be induced to touch any food that it does not catch while yet alive. Ants and flies were repeatedly offered to it the instant they were killed; but, though it was hungry at the time, it always rejected them.

When it has attained its full size, it prepares itself, like all other insects, for that change which necessarily awaits it. It then gives over the chase, as food is no longer necessary for it. It leaves its den, and, burying itself among the sand, begins to prepare that lonely habitation in which only its change can be effected. On this occasion we find, that our insect, like the

silk-worm, the spider, and many others, is provided with a reservoir of silky matter, which is kept in store for this operation. Silk, of every kind, while in the body of the animal that produces it, is a thick viscid fluid, which the creature has power to extrude through a set of organs provided for that purpose, being small holes proportioned to the size of the thread, which acquires its form as it passes through them, as a wire does in passing through its mould. This fluid no sooner comes in contact with the air, than it acquires a consistency sufficient to make it preserve its continuity like a thread; but it retains, for some instants, moisture sufficient to make it adhere to such bodies as the insect chooses it should be fastened to; a single touch, while it is in this state, is sufficient to glue it, as it were, to the body to which it is to be attached, when it instantly dries, and has all the strength that the silk can ever be made to attain. The opening by which the silk of the *Formica-leo* is issued is at the posterior part of the abdomen at *a* in the figure C, where the anus of most other insects is placed, and the silk itself is so fine as to be scarcely at all perceptible with the naked eye. When it has retired to the sand for preparing its house, it begins by joining the particles of sand to each other by means of its silk, which is effected by the means of a sharp organ that it has the power to protrude from the body for that purpose; at the extremity of which the thread issues forth. The point of this delicate organ it applies first to one particle of sand then to another, and another all round, beginning always at the upper side, so as to form a kind of vault above, and thus it goes on, with won-

derful patience and assiduity, till it has thus joined together a large mass of sand, which in this state is found to be adhesive, though still soft, and has then more the appearance of a congeries of loose matter kept together by a net, than any other thing to which it can be likened. The silk is not here perceptible; but on some occasions a single thread of it may be separated for a length by itself, when it appears like beads kept together by an almost imperceptible string. When the ball is thus formed of a sufficient size all round, the animal then proceeds to line this case all over with many folds of its silk laid above each other, till it acquires a palpable consistence; being clear and lustrous like the finest satin, of a bright pearly whiteness. In this soft and close mansion the *Formica-leo* lies concealed for the space of several weeks, during which time, after having disengaged itself from its former skin, it appears under the form of an inactive chrysalis, with its body bent in a circular form to adapt itself to its habitation. In this state the members of the succeeding fly begin to be perceived; at first very obscurely, but gradually they acquire more and more consistence, and appear more distinctly; the abdomen is seen to be lengthened greatly in proportion to that which it bore in its larva state; in this respect differing greatly from that of caterpillars, which are usually very much contracted in length during the change it undergoes in the chrysalis state, the different members being closely laid upon the body, and surrounded, as it were, by swaddling clothes; till at length the animal, which for a long time appeared to be an inanimate mass, gradually acquires life and strength to

break a hole in its case and come forth, when, throwing off the slough of the chrysalis, its wings quickly extend in length, and acquire a firm consistence; and all its other members having at the same time acquired their full perfection, it mounts upon the wing, and pursues its course for the remainder of its life in the air, under the form exhibited in the plate at D, resembling that class of flies which, on account of the elegance of their form, have obtained the vulgar name of *lady flies*.

This fly, as it is destined to enjoy a longer life than that of the ephemera (though the exact duration of its existence has not, that I know, been accurately ascertained), has occasion to take sustenance while in this state, and for this purpose it is endowed with a mouth, and strong teeth for tearing its food and breaking it to pieces. It has, besides, a pair of strong pincers for seizing its prey that project beyond its mouth, and can be extended wide, or contracted, at pleasure. It probably in this state also lives upon insects as before; but it does not reject tender fruits, such as peaches and apricots. It has a pair of antennæ that are thicker towards the point than at the base. Its eyes are two, reticulated and very prominent. From the corcelet spring out four wings, arranged in a manner peculiar to this class of insects, which are represented as if extended when in flight. These are thin, semitransparent, of a dull whitish colour, having some dark spots as in the figure. The abdomen is long.

This fly is among the least prolific of all the insect tribe. The female is often found to contain in its body no more than one egg, which, however, is very large

in proportion to the size of the fly. From this circumstance some naturalists have imagined, that she never lays more than one egg. But the hypothesis is plainly absurd; for, as some of the larvæ must necessarily perish before they attain perfection, and as there are males as well as females, did the female lay only one egg, the whole race must soon be totally exterminated. The fact is however, that the eggs are few, and are deposited one by one; and this breed of insects is, of course, so little numerous as to be in no danger of ever becoming either extremely destructive or troublesome.

There are several species of the *Formica-Leo*; one of which, found by Mr. Bonnet in the neighbourhood of Geneva, made no sand traps; and had the power of moving forward in the usual way. But the one here described is at the same time the best known, as well as the most singular in its habitudes. The others are extremely rare.

The fly here described is the *Myrmeleon formicarium* of Linnæus. *Syst. Nat.* page 914, n. 3.

Some of the flies of this class are singularly elegant and beautiful; but many of those which are called lady flies (*Libellulæ*) proceed from larvæ of a very different kind from the formica-leo; they form a different class, which we shall probably specify more particularly on some future occasion.

The male of this fly, like that of most insects, is considerably smaller than the female.

[To be continued.]

MISCELLANEOUS LITERATURE.

Thoughts on the origin, excellencies, and defects of the Grecian and Gothic styles of Architecture.

[Continued from Vol. II. page 434.]

On the progress of Gothic Architecture.

I AM afraid that some of my readers will be dissatisfied at being so long detained in tracing the progress of an almost unknown, though very enlightened society of men, which sprang up in an age of such universal darkness, that little else has been recorded of them but their name; which has been indeed transmitted to our days, though under such clouds of obscurity as to convey no idea of its original splendour. To those, however, who wish to trace the progress of the human mind, and to contemplate the powers which man may attain when his energies are suffered to be steadily exerted for a sufficient length of time on one object, without experiencing the deadening effect of any restraining influence, such an investigation must be peculiarly interesting. In the hope, then, of compromising the matter between these two classes of readers, who may be supposed to be mutually inclined to yield a little to each other as occasion may call for it, I shall now proceed to lay open a few more circumstances illustrative of the attainments of the society of *free-masons* during those dark periods of time which we now call the middle ages.

Long before the period which now engages our attention, considerations of great weight had induced

the Christian world to make choice of the form of a cross in preference to all others, for structures that were to be appropriated exclusively to divine worship, and of course our artists were restricted to that form in the churches that they were to rear. The wide opening, therefore, in the middle of the church, of which we have already taken notice [Vol. II. page 428], and which was technically termed the *nef*, or *nave*, was crossed at right angles at some distance from either end by a similar opening, which was called the *transept*, which last was usually extended in length considerably beyond the width of the church. In consequence of this conformation, our artists felt themselves subjected to a two-fold difficulty, which it behoved them, if possible, to overcome. The first was, that of providing a proper abutment for the large arches, where the interruption took place at the transept; and the next was, to give light to this central area, which, without some contrivance for this purpose, must have been the most obscure part of the church, on account of its great distance from the windows placed at the ends of the cross. They were now, however, in a train to be able to discover how these defects might be both remedied at the same time. By raising a wall to a considerable height above the four wide arches which formed the central square, they added the weight of an abutment above the pillars, so as to give them the proper degree of stability, and by placing windows in these walls when thus carried higher than the roof of any part of the structure, they obtained there an irradiation of light, which, without dazzling the eye, communicated to

this part of the building a softened splendour that could not have been otherwise obtained, and which gives to these structures a lightness that conveys the sensation of a supernatural influence which is not experienced in any of the other structures wherewith we are acquainted. This sensation is experienced by every person whose mind is susceptible of such impressions, when he finds himself first placed within the sphere of its influence, whatever his situation in life may be, from the meanest beggar to the most exalted monarch in the world, and without the smallest intervention of reasoning on his part. Nor can it be doubted, that these artists themselves, when they first experienced its effects, must have been highly delighted with their good fortune in having been able thus happily to succeed in this the great object of all their wishes: neither need we be surprised, when we advert to the effect it must have produced upon the minds of the numerous visitors who would flock from all quarters to see it for the first time, that princes and prelates should put so much value on these unlooked for attainments, as to deem the acquisition of such artists an object of sufficient importance to call for the most solemn embassies from one nation to another, in order to obtain them; as we know to have been frequently the case, on the evidence of documents that are still preserved, and which have been sometimes quoted by unthinking ignorance as specimens of the puerilities of the times. If these were indeed puerilities, it will be at least admitted that they were puerilities of a more harmless sort than wars, destruction, and pillage, carried on by one nation upon an-

other for the acquisition of objects of taste, whose influence will not be so universally recognised, and whose value is at least of a more problematical kind.

We are thus led to discover the origin and primary uses of those central towers which constitute such an important part of Gothic cathedrals; and which laid the foundation for one of the most pleasing discoveries in architecture that have been achieved by man, and that contributes more to heighten the beauties of nature than perhaps any other work of art, because of its more general diffusion on account of its facility of execution, than any work of equal beauty. The reader will easily conceive that I here allude to church towers and ornamental spires of every sort, which tend so much to diversify and enliven the prospect in every country in Europe at almost every step that a man makes in his progress through it. Let him but for one moment suppose that all these were annihilated, and that the world were reduced to the same situation in this respect as it would be during the most flourishing periods of antiquity, and he will be confounded at the immense inferiority in point of general effect between them. Take away the spire of the peaceful village peeping at times between the varied openings of the tufted trees—what a beauty would be lost! But I must not enlarge on this bewitching subject. I only just touch upon it, that the reader may not entirely lose sight of those humble artists, who, like Milton, and many other geniuses of the most exalted cast, have been too long deprived of that fame which was so justly their due. In paying this homage to departed merit, I feel a sort of melancholy satisfaction, like that

of one who collects together the earthly remains of a great man, which had been subjected for many ages to the most cruel indignities, to give them at least an honourable burial. This is a weakness I will allow; but it is a weakness that ought to be tolerated with indulgence.

I call spires a modern invention, not because there was nothing of a similar sort in ancient times, but because they are constructed upon principles wholly different from any of those; and are adapted to answer the various purposes alike of utility and ornament with a happier effect, and at an infinitely less expence than any of the structures of antiquity. I do not forget the temple of Belus, otherwise called the tower of Babylon, nor the pyramids of Egypt; those stupendous structures, whose magnitude alone can never fail to make a strong impression upon the mind of every person who can have an opportunity to see them. I forget not the obelisks of Egypt, which have been with such a happy propriety called by the French *Les Aiguilles de Cleopatre*, Cleopatra's needles; neither do the pillars of Pompey and of Trajan, nor the colossal statue of Rhodes escape my memory; all of which tended, in some measure, by rising above surrounding objects, to enliven and beautify the scenes in which they are placed. But these, in effect, independent of number, can never be compared to modern spires, which admit of such an infinite diversity in form as well as magnitude, as to adapt them to every variety of situation and circumstances. The obelisk at a distance appears to differ but very little from a walking rod; and as to the effect of Pompey's pillar, had it

never been nearer than Egypt, and could we have only contemplated it in idea from descriptions, or in its representation by itself in a print, we might have been excused for admiring it as a sublime exertion of taste; but when it is brought home to our doors, and placed within sight of so many Gothic spires, as at the *Monument* in London, the charm is dissolved; and, setting the prejudices of education aside, we see it in all its nakedness, and are enabled to appreciate justly its proportional merits. Upon this investigation, however, I mean not at present farther to enlarge. I only wished to say, that none of these could have served to suggest the idea of church towers and spires to our artists, who seem to have been led in every step of their progress by an idea of fitness and utility; which primary object being once obtained, they then tried to give it such a form as should render it an object of taste as well as utility: nor shall we find that they were deficient in uniting these in their towers any more than in the other parts of the structures which we now examine. The reader will also recollect, that China was unknown to them, and that the towers called by us *pagodas*, which more nearly resemble in effect our spires than any other, could not have contributed in any respect to the formation of those structures.

Those central towers being formed of stone arches supported by pillars, as every other part of the church, when viewed internally from below, obtained the name of the *Lantern*, as the upper part assumed the form of a square with lights on each side. These arches, like all others, stood in need of abutments; and, as our artists frequently found that it would not

be convenient to raise buttresses on the outside of the tower to serve as abutments to these arches, they were induced to adopt some other plan for effecting that purpose. The expedient which they found the easiest was, to raise the walls to a considerable height above the arches, and thus to give firmness and stability by weight. To this expedient they usually resorted; and as they observed that additional height in the tower gave a dignity and elegance to the whole pile which it did not before possess, they found it convenient, on most occasions, to make an apartment above the lantern dome, in which was placed their largest bells; carrying the walls, if its roof was arched, to a considerable height above that roof also, where they were terminated for the most part by open rail-work with pinnacles at each corner, the roof being here flat wood-work covered with lead, and supported by beams laid across from side to side. Such are the origin and uses, and such is the form that most of the central towers assume.

But on some occasions it was judged more expedient, that the flat form of the top of these towers should be abandoned, and something of a spire-like shape adopted in its stead: nor was this found to be an insurmountable difficulty to our artists. On some occasions, a close spire was reared to a great height. These spires, for the most part, were reared of timber; as in the cathedral of Old St. Paul's, London, and the cathedral of Lincoln; but where they were required to be made of stone, this also they knew how to effect. The various devices which they adopted for this purpose would require a volume to enumerate. These indeed are so diversified, and all of them so well

adapted to the purpose intended, as to have stood for many ages perfectly firm, though many of these fabrics appear to unskilful observers so light and slim as to be in danger of tumbling to pieces by the slightest shock. Among these, the steeples of the cathedrals of Antwerp and of Strasburgh have attracted the notice of all strangers, and have often been described by travellers as objects deserving the highest degree of admiration, on account of the surprising symmetry of the whole, the wonderful delicacy of the parts, and at the same time the firmness and stability of the structure. Of this last stupendous fabric, I recollect to have seen an elegant engraving by Hollar; but this was only a general view. It is much to be regretted, that no person hath as yet thought it worth his while to give architectural designs of the plans and elevations of the whole, and the several parts of this and similar structures, by means of which the mechanical contrivances of the artist might be completely unveiled. This is a work that will give scope to the ingenuity of some of our descendants. In the meanwhile we know enough of these contrivances, even from the few structures of this sort that at present exist in our own island, to be able to perceive that it was by that accurate knowledge they had acquired of the principles and powers of the stone arch, and the means of diversifying its forms so as to adapt it to every purpose which they wished to effect, that they were enabled to produce those surprising combinations which have extorted the admiration of all beholders, without having been able to awaken the desire in any one to acquire the knowledge of the means by which these things have been effected.

In some cases these towers were capped with solid spires of stone, as in the cathedral church at Old Aberdeen, a view of which is annexed from a drawing made by a friend in its present state. These, for ob-



Bewick sculpt.

A West View of the Cathedral of Old Aberdeen in its present state:

vious reasons, are made to consist of a spire of a very *elevated* conical shape: but, for the most part, these spires consist of open work at top, and have been thrown into a great diversity of forms according to the taste of the architect. In some cases, they were made to consist of very light open work more resembling the *treillage* of Chinese work than any other structures, as in the spire of St. Nicholas's church, Newcastle, of which an excellent engraving on wood by Nesbit was lately published from a drawing by Mr. Johnston, an ingenious young artist lately deceased, and is sold by Mr. Nesbit, 132, Fetter Lane, for the parents of Mr. Johnston. Others are in the form of an Imperial crown, as on the college chapel of Old Aberdeen, a rude view of which may be seen in a very bad print published some years ago along with a book entitled, "A description of the chanonry, cathedral, &c. of Old Aberdeen," by William Orem, Aberdeen, printed 1791. Others in the form of the papal crown, as in the steeple of St. Giles's church in Edinburgh, which, being extremely simple in its construction, may serve to give the reader a slight notion of the manner in which our artists contrived to vary the form of their ornaments, so as to produce the effect as to the general symmetry which they had in view; at the same time that each of these ornaments contributed its share to add to the general stability of the whole.

What I have said, of this spire having been intended to bear a resemblance to the Roman tiara, is merely from conjecture, founded on the general resemblance that may be easily renognised between the one and the other, though they differ in this respect,

that the tiara is a *solid* circular *bilged* cone; (by which I mean to say that the section of the base of the cone is circular; but the section taken from the base to the apex consists of two segments of a circle terminating in a point at top, and widest at the base), and that the spire consists of open ribs only, without having the intervals between closed up. In this case, as the plan from which the ribs of the spire rise is square, though the general appearance is always nearly the same, yet it is obvious, that the proportions must vary a little when viewed in different positions; for when the tower is viewed in a diagonal direction, the cone must appear flatter in its proportions, because wider at the base, than when viewed in front, as the base of the diagonal is longer than one of the sides. This might appear to some, at first sight, to be a defect, though it is in fact the source of no inconsiderable beauty, as it exhibits the spire under varied forms, though it be still recognised as the same. In like manner, the open form of the ribs is a source of similar diversity, and of a never-ending variety of appearances; especially when viewed near, and of course from below, where the external projections seen from beneath some of the nearer ribs exhibit a diversity of combinations as you move, whose effects, though pleasing, are by no means easy to be comprehended. This may serve to give some faint idea of the incomprehensible nature of those complicated appearances on such high open large towers, consisting of many parts of this nature properly joined together, which excites that degree of astonishment that travellers dwell upon with admiration. Considering these things, it

is proper that I should here remark, as will appear very obvious to any one who is acquainted with the principles of perspective, that the general form which exhibits the resemblance to the tiara can be only perceived when the spire is seen from a great distance, or when it is viewed from any object that is nearly on the same level with the open part of the spire itself, where only its shape can assume nearly the same appearance as if it were solid throughout the whole.

The papal tiara consists of a high bilged conical cap, of a similar form to the outline of the ribs of our spire, having an ornament consisting of a triple band surrounding it. It is a matter of no great difficulty to point out the devices in the present case (they being very simple) which the artist had adopted to give to his spire the same general appearance, while matters were, at the same time, so contrived that every device tending to preserve the resemblance should add to the stability of the fabric. As this kind of analysis may lead to something of the same kind in other cases, it will not, I hope, be deemed impertinent.

As the pinnacle above, which was required for giving an elegant finish to the top of the spire was necessarily of considerable weight, the arch of the ribs must of course be so placed as not to diverge far from the perpendicular, in order to allow the pinnacles at the base, and those on the middle of the ribs (which not unaptly represent the bands of the tiara) to be made of a moderate size suitable to the occasion. With a view to give that requisite degree of elevation to the ribs, without departing too much from the proportions of the tiara, the artist made each of the ribs

to consist of two segments of a circle (one of which formed the inside and the other the outside of the rib), that were so arranged as nearly to approach each other at the top, and gradually diverge wider from each other towards the base; an exact idea of which may be conceived, by supposing a perpendicular section of an elephant's tusk from the point to the base, in the same plane with the curvature of the tusk. By this means a great part of the weight of what should have formed the abutting pinnacle was thrown into the base of the rib itself, so that the pinnacle here required might be with safety reduced to a very moderate size; and for the same reason the pinnacle required on the middle of the rib to prevent it from being pushed outward in that place by the weight above, could also be with safety diminished to the proper dimensions. The clear-sighted reader will be enabled to perceive, by this simple illustration, with what facility, upon these principles, our ingenious artists could diversify almost at pleasure the forms of these open-topped spires; for if the pinnacles in any particular part were required to be lofty and massive, they could adapt the form of the inside arch of the rib so as to carry that weight there without deranging its external appearance; or they could give the same weight without the appearance of a pinnacle at all, by consolidating it in the body of the work; or it might be effected in a great diversity of other ways, which an attentive observer will be able to discover, whenever it shall be investigated by the eye of intelligence. He will then be able to unveil that necromantic spell by which the eyes of the vulgar have been fascinated for so many ages; and, instead

of being confounded with inexplicable *miraculous* appearances, he will be charmed with the perceptible display of *wonderful* ingenuity combined with the most beautiful simplicity.

Though our artist chose on the present occasion not to imitate the tiara so closely as to render the structure solid, yet he chose not to depart from it so far as to give it too open an appearance; to avoid which, he not only gave the ribs a greater depth than he needed to have done, had he so chosen it, but he also, instead of four ribs sprung from the corners only, chose to add four others sprung one from the middle of each side of the square, making eight in all. I shall only add, that in this spire there is an ugly blemish which evidently formed no part of the original design, but must have been an addition afterward made by some tasteless improver, at least that part of it which rises above the parapet wall. What I here allude to is a stair that has been formed in the wall, as is very usual in large steeples to get up to the top. It probably was carried so far by the original architect as to lead to the highest floor within the parapet; but has been afterwards raised to its present height by some ignorant innovator. It is a pity that such a fine structure should be spoiled by such an ugly excrescence, which might be taken away without any danger to the pile; and it certainly would do honour to the man who should remove such an incongruous projection. A stair to lead up to the musical bells (for which purpose it has evidently been constructed), might be easily contrived that should not be liable to the same objection.

When the art of constructing towers and spires was

once attained, it cannot be thought wonderful that they became a favourite object with the people at large, as well as with the artists themselves, who had here an opportunity of displaying to great advantage the luxuriance of their imagination, and the resources of their genius. Hence it came into fashion, not to content themselves with one central tower only; but it became quite common also to erect two smaller towers on the west end of large cathedrals, which stood in the place of abutments to the two rows of columns on each side of the middle nave; though they contented themselves, for the most part, with plain abutments on the east end, which were sometimes constructed in the truest taste of elegant simplicity, as in the east end of the cathedral of York, which forms upon the whole a front that to me appears exquisitely elegant. I shall probably do myself the pleasure to give a general view of it for the satisfaction of the reader, when I shall perhaps have occasion to refer to this object in some future part of these disquisitions.

There remains still one other peculiarity respecting Gothic cathedrals which is highly deserving of elucidation, as it is the source of one of the most exhilarating domestic comforts that has been conferred upon the inhabitants of high latitudes, and which we owe entirely to the exertions of that fraternity whose intellectual progress we have for some time past endeavoured to trace with a steady degree of attention. I here allude to windows.

We have already remarked, that the Greeks paid scarcely any attention to this article in their temples;

and the Romans deviated as little from them in this as in other respects. Indeed, it necessarily must ever claim a smaller share of attention in warm climates, where men find it pleasing to associate together in the open air, than in colder regions, where the inclemency of the climate is such as to render the shelter of houses, closely surrounded on all sides absolutely necessary for the comfortable enjoyment of life during the greatest part of the year. Walls, therefore, became necessary to exclude the external cold from persons within, and light at the same time was required to enable them to discharge those duties which were to be there performed; windows, of course, became an essential part of such structures; and we shall soon find that our artists succeeded as happily in the arrangement and distribution of these, as in any other part of the arduous task which they had imposed upon themselves.

Any one who has adverted to the foregoing part of these elucidations must have perceived before this time, that the walls of a Gothic cathedral may be considered merely as adventitious screens, which, forming no constituent part of the structure, might be wholly removed without endangering its stability in the smallest degree. It is the pillars alone which support the whole of the roof, totally independent of the walls. It follows, of course, that as the walls have nothing but their own weight to support, there is no necessity for making them of a clumsy thickness. A necessary consequence, then, of making the walls thus, is, that wherever an aperture is made in them for the purpose of a window, the light is permitted to enter with an unincumbered

freedom, so as to be diffused around without being accompanied with that depth of shade which a thick wall must necessarily engender, and which occasions a gloom that is far from being pleasing. The same circumstance which enables the artist to diminish the thickness of the walls, removes from him every degree of restraint with respect to the dimensions of the aperture; so that he is at liberty to include the whole space between the pillars (if he so inclines) in the window. Our artists freely availed themselves of these advantages; but, observing that light, when thrown in from above, produced a more pleasing effect than from below, their general practice was, to fill up the under part of the aperture between the pillars with a solid wall (placing on many occasions a resting seat between them); and at the height of six, eight, or ten feet, according to circumstances, from the floor, they began the window, dividing the whole into many compartments, by a lattice work of stone, lightly and delicately cut, and sometimes deviating into tracery work of extraordinary elegance and beauty. These light combinations of tasteful imagery prove at all times singularly pleasing and attractive, while the abundance of light diffused every where around produces an exhilarating sensation that tends to elevate the mind into a kind of supernatural ecstasy. The magnitude alone of some of these windows conveys an idea of sublimity, which, when compared with the windows adapted to any other style of architecture practised in Europe, exalts those of which we now speak to such a proud degree of pre-eminence as almost precludes the possibility of drawing a parallel between them. The east window of York cathedral

measures, if I mistake not, seventy-two feet in height by thirty-five in breadth; and this is equalled or surpassed by many others. To our artists, then, we owe the very primary idea of windows calculated fully to illuminate structures of immense magnitude and grandeur.

Having thus taken a cursory view of the principles and progress of that style of architecture which has been usually called Gothic, and the purposes which it was intended to effect, it remains that we should attempt to draw some sort of parallel between that and the Grecian mode of architecture, that the reader may be enabled the more easily to perceive their respective excellencies and defects, and thus to discover in how many respects, and in regard to what particulars, they respectively and both fall short of the purposes of a complete system of architecture, fitted for the various purposes of human life. We as yet but touch the threshold; though some think that they have gained the *acmé* of perfection; but, notwithstanding this is far from being the case, let us not despair—*Plus ultra*.

The extraordinary Robber.

[Translated from the Travels of Gojani.]

The Public are indebted for this agreeable and interesting article to the same gentleman who translated the Travels of the King of Naples, Vol. II. page 376. It brings to mind the adventures of Robin Hood in England, and the imposition called *black mail* in Scotland, and exhibits a lamentable proof of the evils that spring up in society from a weak and inefficacious government; at the same time that it gives an

example of heroism in the lowest station of life, and of virtue under the guidance of an erroneous judgment; for the person whose memory it serves to perpetuate was, doubtless, a hero of the first class; and virtuous, though a robber. It is impossible for any one who contemplates this picture not to regret, that the good which *might* have been done by such a distinguished personage, was, from an unlucky combination of circumstances, unfortunately prevented from being experienced among mankind.

DURING my first journey to Naples, there was much conversation about a leader of a band of robbers, whose name was Angiolino del Duca. He was a man of the most undaunted courage, and had also a good understanding. He robbed the rich, and did a great deal of good to the poor. He never attacked travellers, especially if they were foreigners; nay, he even gave them an escort, that they might not be pillaged by any of the parties who were dependant on him. He contented himself with putting the barons and great lords under contribution, against whom he had formally declared war.

Angiolino del Duca travelled through different towns and provinces; and, whenever he made a stay at any place, he ordered a tribunal of justice to be prepared, where he heard the suitors, pronounced sentences, and performed all the functions of the magistrates. It is said, indeed, that he distributed justice much better than the common judges, and without receiving presents, as they always do; it is true, that he had an unfortunate prejudice against the rich; and thus it may have happened, that some times he may have condemned them unjustly, being perhaps also urged

to this unjust act towards them from a desire of rendering the mob favourable to him.

In one of his expeditions, accompanied by his troop, he overtook a bishop who was going to Naples. He asked his lordship how much money he had with him? The bishop owned that he had a thousand ounces. "Why (said Angiolino) you will only want half that sum for your expences at Naples, and for your journey back to your diocese; give me five hundred ounces, and may God accompany you."

This redoubted robber wrote very polite billets to the barons and farmers, asking them for money; but often compounded with them; so that, having at first demanded a certain sum, he was contented with a half, or a third of it. He afterwards promised them to remain for a certain time without importuning them, and strictly kept his word. He was commonly called the country king, and was every where obeyed, respected, and much beloved by the common people.

Angiolino del Duca was the Hercules and Theseus of his time; or rather the Don Quixotte, who repaired wrongs, and redressed injuries: succouring the oppressed, assisting the poor, but always placed between the wheel and the gallows.

A rich Benedictine abbot, having in his portmanteau two thousand five hundred ounces of gold, by ill luck fell into the hands of Angiolino. The robber, however, took only one half of this sum; of which, he said, one part should be the marriage portion to a poor girl; another part should go to help some wretched peasants; and the remainder to supply the wants of his troop.

From the moment when he was arrested and loaded with chains, he comported himself with great dignity and resolution. All the world was interested in his fate. His judges proceeded in a summary way with him; for, had they followed the common forms of the law, Angiolino would not have been cut off by the hands of the hangman. The Neapolitans, to this day, speak of him with enthusiasm, and consider him as a martyr who fell a victim to his love for the people.

This resolute robber, having but twenty-five men under his command, was bold enough to open a negotiation with the king, offering to maintain the greatest security through the whole of the internal parts of the kingdom with his troop alone, provided his majesty would grant him some honourable distinction; and only asked the common pay for himself and for his men. This robber, in fact, was very disinterested; for he divided his booty with a scrupulous equality among his companions, being himself satisfied with the honour of commanding them; and was anxious that each of them should personally see the accounts, and be acquainted with the state of their finances.

Angiolino del Duca never committed a single assassination, nor even a robbery with violence, contenting himself with politely asking personally, or by billets written in the most civil terms. His conduct had so much won people's hearts, that when he appeared in any place, the people went out to do him honour. His men respected him, and obeyed his orders with the greatest punctuality.

Placed in a more advantageous situation, this man would have been able to have rendered the most essential services to the Neapolitans; more especially in a revolution similar to the one that has lately been effected in France; which would be very necessary to reform the abuses of this government, whose oppressions make all the inhabitants of the two Sicilies to groan.

The reason of Angiolino's putting himself at the head of a troop of banditti was this: he was a poor peasant, who employed for his daily labour a mule belonging to his lord. This beast happening to die, the lord exacted payment for it: Angiolino was not in a condition to pay the money; he was sued, and obliged to sell the few effects he was possessed of. Reduced to despair, he associated with robbers, and became the curse to that nobility of whom he sought ever after to revenge himself.

One of the greatest wrongs which he reproached the barons with, was the profound ignorance in which they kept their vassals. As soon as he became the country king, as has been related, he was ashamed of having so little knowledge. He learned to read and write, and was admired for the energy and precision of his style. A lawyer, a curious man, and one who always took pleasure in speaking of this famous robber, had made a collection of his letters. I have read some of them, which have appeared to me to be written with that dignity and force of style which become a chief accustomed to give orders, and to see them executed.

TO THE SPRING.

A VOLUNTARY.

LAURA. HENCE! rough northern Wind,
And on your ruthless pinions bear
The frosty relics of the iron year;
Nor leave behind,
Amidst the yet unfolded buds of May,
The insects which infect the blighting air;
But on your wings the noisome vapours bear,
And to the polar caves convey,
Where night and silence baleful shadows hoard.
Thither, ye blasts, with congelations stor'd;
Scowl hence, ye low-hung clouds, and clear the day.

Invade not the young spring,
Whose mantling verdure hails the kindly showers,
Whose opening buds my random numbers sing.
I'll sport awhile amidst the trees and flowers:
While genial suns shall panting nature free,
Unlock the earth and clothe the barren tree.

Each germ expands and into fragrance blooms;
Myriads of embryos rising burst to light,
And from their murky tombs
The various insects wing their wanton flight,
All lightly fluttering, spring's sweet breath respire,
Pierced by the sun's warm rays, and life's enlivening fire.

HENRY. On the light winds sweet sound incessant floats
Of woodland melody in wildest notes;
I listen 'midst the springing herbs and flowers,
Whilst morning sweets dispense
Their liveliest influence;
And sudden through the fragrant frolic air
A flood of heavenly music pours.
See where the sweet enchantress flits along,
Rousing the unpois'd lark with earlier song,
Toward the orient o'er yon hills,
Why wand'rest thou alone and far?

Is it to view the rising sun,
 Or mark the fading morning star?
 Does heaven's grave front midst smiling light,
 Flaming with kindling gleams of fire,
 Which dart through every trembling cloud,
 With kindred warmth thy breast inspire?

Wild as the winds which fan the trees,
 Inconstant as the spring you stray.

LAURA. Or gay as summer's kindly breeze,
 Amid the scatter'd blossoms play.

Who would this glorious arch resign,
 For gilded roofs and idle state?
 Nature's extensive range be mine,
 Far from the woes which mock the great.

The morning dight with sparkling dews,
 Or splendid noon's refulgent rays,
 Mild eve, or night sublime with stars,
 Alike delight, and force my lays.

Or whether spring unfolds the bud,
 Or summer's ripening blaze invites,
 Or autumn pours her various fruits,
 Or winter's frown each beauty blights;

Still o'er each scene with secret joy
 I muse, and wildly tune my lays;
 Each theme responsive to my heart
 Echoes the great Creator's praise.

HENRY. Like thee, fair nature's paths I love,
 For in her haunts the Muses stray;
 O let us then together rove;
 Youth join'd with love shall hail the day.

LAURA. "Wild as the winds which fan the trees,
 Inconstant as the spring I stray;"
 Or gay as summer's kindly breeze,
 Amid the scatter'd blossoms play.

MIRA.

To the Editor of Recreations in Agriculture, &c.

SIR,

HAPPINESS is a subject which has often employed the pens of the most celebrated writers of all nations; and many questions of universal importance have been started, upon which, as philosophers are not yet cordially agreed, the subject cannot be said to be exhausted. It has been, for example, inquired whether happiness is most complete in the savage or the civilized state? It has likewise been asked, whether there is more pain or pleasure in the world, or, in other words, whether the aggregate of pain exceeds that of pleasure?

This last appears of much consequence. Most writers concur in the opinion with which Mr. Archdeacon Paley concludes his elaborate dissertation on this subject, namely, that "happiness appears to be pretty equally distributed." You will perceive a cautious latitude in this decision, to which I shall not at present advert, because the purpose of my letter to you is to advance a position, not only in direct contradiction to it, but to the generally received opinions upon the subject. I state my position in these words, that "THERE IS TOO MUCH HAPPINESS IN THIS WORLD," and consequently it has appeared to be the duty, and certainly has been the practice of mankind to lessen this EXCESS of HAPPINESS in all stations where it is found.

I have already hinted, and I now avow more particularly, that this opinion is a new one, that is, it

has never been before asserted in express terms, and therefore I must expect the fate of all innovators—to be reviled and censured for advancing what thwarts not only the prejudices but the opinions of the rest of mankind. However, sir, I am prepared for an opposition of this kind. I trust I should not have adventured to add to your *Recreations*, had I been coward enough to shrink from the consequences; and I repose, with perfect confidence, in the good opinion of those readers to whom my *proofs* shall appear convincing. What my proofs are you shall now hear.

Happiness, according to the opinion of the most eminent authorities, consists of certain component parts or ingredients. These have been often enumerated, and I shall take them as I find them in the above authorities, without inquiring whether the arrangement be regular, or whether some additions may not be made. And I shall prove that there is in all these ingredients an excess which men feel so strongly as to be inclined to lessen it by every means in their power.

First, we are told, that happiness consists “in the exercise of the social affections.” Of this I presume no man can have a doubt, who knows what the social affections are. But it is evidently certain, that our happiness arising from this source is excessive, because men have been obliged to invent sundry ways and means whereby the said affections may be diminished in fervour, and shortened in duration. That excess of friendship, for instance, which would, if left to itself, produce a fatal *plethora* of felicity, is happily brought down by various operations of jealousy, rival-

ship, connexions, private interest, and other *stimulants* properly applied and frequently repeated. And besides these more violent, and, as the apothecaries term them, *drastic* medicines, most people find it necessary, in order to abate the fever of social affections, to enter into a course of *etiquette*, which, long continued, seldom fails to reduce them to a mild and insipid state; abating the strength of the feelings, and reducing the meaning of words and declarations to a mere non-entity. It is said that, without such a modification as this, there would be no going through the world, and we should, like Parson Thwackum in the case of Mr. Allworthy, “mistake the highest degree of goodness for the lowest degree of weakness.”

The social affections, therefore, having a tendency to produce an excess of happiness, which every one knows it is in their *nature* to produce, it became expedient to invent etiquette, mode, fashion, and economy, all of which are wonderfully calculated to prevent the *exercise* of the social affections from becoming excessive, and fatiguing the body or mind. I might enumerate the many ways in which they produce this effect, and their various operations, from a rout in St. James’s Square, to a party at whist and swabbers in Whitechapel; but the subject would carry me far beyond the reasonable bounds of a letter. I shall, therefore, proceed to a second source of happiness.

Secondly, “The exercise of the faculties of body or mind for an useful purpose.” There can be no doubt that this ought to stand prominent as a source of happiness, but it is to be *lamented* that it is liable to run into the same excess with the former. To counteract

it, therefore, some very ingenious persons, both of the former and the present age, have devoted their time and talents to the invention of various kinds of amusements, spectacles, shows, sights, exhibitions, galas, routs, assemblies, promenades, &c. &c. &c. in which the body is exercised in a very small degree, and that for an useful purpose, and in which the mind is left totally unemployed and disengaged. Men are convinced, sir, of my position. It is tacitly but universally assented to. I have only given it *words*. They know that they would be too happy if engaged in useful pursuits. They suspect that the few who are so are too happy: and they think it their duty to lessen this degree of happiness in their own case, lest it should be said that they are so selfish as to live for themselves alone, instead of living for the benefit of every showman in the kingdom.

Thirdly, happiness is said to result from "a prudent constitution of habits," or, in other words, from "acquiring good and prudent habits." There are many ways in which the happiness that arises from this source may be moderated; but, perhaps, the most effectual is by acquiring no habits at all, and cultivating that taste for variety which constitutes the fickle character of a neighbouring nation, and which occasioned a friend of mine to observe that the *way* in which some men *go*, is a "hop, skip, and jump." Certainly, to be alive to every frivolous novelty, must greatly tend to obviate the regularity which would arise, and the happiness which would accrue from "a prudent constitution of habits."

Fourthly, happiness is said to consist in "health."

Of this men are so sensible, that it is become almost proverbial to say that health is the greatest blessing under the sun, and that all blessings are torments without it. It is evident, then, that from a blessing of this description a great *excess* of happiness must be created. If it not only operates itself in producing happiness, but, like the great wheel in a machine, sets all the other causes in motion, it must require *keeping down* more than any we have yet enumerated. Well, sir, (thanks to the inventive faculties of mankind) we are not left here without a remedy: "Life is short," says Hippocrates, "but *art* is *long*." Very powerful means have been discovered for counteracting nature's intention in bestowing this blessing. They are constantly at hand; they are sanctioned by general practice; they are pleasant to the taste, and sparkling to the eye, and so popular, that even other governments, as well as our own, have not disdained to extract a considerable revenue from the propensity of mankind to lessen the happiness that arises from health. Indeed, this propensity alone, if I had no other arguments to produce, might of itself amply confirm my position, that there is too much happiness in the world, or, to parody the words of a late great orator, that "happiness has increased, is increasing, and ought to be diminished."

Fifthly, wealth may be reckoned a source of happiness. I know there are discordant opinions upon this subject, which, I humbly presume, arise from the improper use that some men make of their wealth. But it is neither logic nor common sense to argue from the abuse against the use, and surely that must

be useful which every body wishes to acquire. Conscious, however, that the happiness arising from wealth may, like the other forms of happiness, be excessive, men have invented certain very curious processes by which it may be melted away. I call them *curious*, because the means, to all human appearance, are so disproportionate to the end. Among these are a set of bits of paper of an oblong size, marked with grotesque figures of men and women, and with red and black spots, and small cubes of ivory with black dots. There are also boards painted white and black, or black and red. Certainly, *at first sight*, these seem very ill calculated to move such heavy masses as are formed by gold and silver, yet nothing is more certain than their operation, and we know that in mechanics it is not necessary that the weight of the lever, pullies, &c. should bear any great proportion to the weight they are to move. All the rest is performed by a certain power which we call force, and which cannot well be explained or exposed to the eye; much the same is the case with the abovementioned little implements, which are of such wonderful powers, that they have often removed very large landed estates, and it is a common occurrence for one or two of the painted bits of paper to carry off a coach and horses in a night's-time. But in whatever way they operate the effect is certain, and we could produce many well-attested cases of their efficacy in diminishing the happiness which arises from riches, in turning mountains into mole-hills, and palaces into prisons. But a detail of this kind might perhaps hurt the feelings of others who, in their attempts to *bleed* for the *plethora*

of wealth, have carried the system too far, and have rather imitated the rashness of Sangrado than the prudence of the college.

To the above means of reducing wealth, and thereby bringing happiness to a moderate temperature, may be added the use of certain animals, such as the horse, whose swiftness or slow motions have been found very effectual. A certain description of women, likewise, are found to prescribe with great success in full habits arising from wealth; and some of the patients have had so strong a sense of the goodness of their prescriptions, as to *keep* one constantly in the house to be ready at hand. There are likewise certain modes of conducting domestic expences which have a tendency to alleviate the burden of opulent felicity, but these are too obvious to require particular notice here, although I think I may fairly appeal to them in confirmation of my position.

There is only one other source of happiness, which I shall enumerate, because, although others remain, what I have already advanced will be sufficient as a sketch of my doctrine, and more than a sketch would not have suited the size of a common letter. Undoubtedly every reader of experience in the affairs of the world is ready to fill up my outlines, and it is not respectful in a writer to be so minute as to leave nothing to the apprehension of his reader.

The source of happiness I mean to conclude with, is "the hope of immortality," and the belief consequent thereupon. Now, although I have placed this as the *last*, I trust my readers are all ready to concur that it is not the *least*. It is, indeed, paramount to

all we have yet named, and *therefore* it is a source of happiness which men seem most eager to diminish. They are more afraid indeed of it than of any other, or all put together; and hence the contrivances to *moderate* the excess of happiness which it would produce have not been the invention of the vulgar, or the low. Men of genius and taste, philosophers, and the great of the world, have combined to take this “hope and belief” from us, that we may not be so happy as it was intended we should. Books of all sizes and descriptions have been written for this purpose. Dictionaries, histories, essays, poems, romances, novels, and even plays, have all lately contained a portion of the *sedative* quality to reduce our happiness as arising from this quarter. The *great charter* upon which it is founded has been made the scoff of libertines and fools. How far these methods have been effectual in this country, it is not for me to say; I *hope* it is not to such an extent as I *fear*; and I *trust* it is not to such an extent as *designed*. But there is a nation, not greatly removed from us, where the happiness arising from “the hope of immortality” has been diminished, I presume to the taste of the fondest admirers of unbelief, and perhaps (as far as respects their own headless corse) farther than they intended.

And this remark leads me also to say, that while I flatter myself I have demonstratively proved, that “mankind are too happy, and that happiness wants to be reduced,” I cannot conceal the fact—candour forbids it—I cannot conceal the fact, that we have in some instances carried our system of reduction too far. There are some men who cannot reduce without

annihilating, and can make no pause between *less* and *nothing*. If mankind are really so extremely happy, as they would prove by their practices, why not modify gently? Is there no remedy for a plethora, but bleeding to death? These are questions which I could wish to recommend to the serious attention of our new doctors; for, although I have proved my position as an historical fact derived from the practice of the said doctors, I have not bestowed, nor do not mean to bestow, more approbation upon it than can be fairly inferred from the general tenor of this letter. I am, sir, yours,

EUTYCHES.

To the Editor of Recreations in Agriculture, &c.

DEAR SIR,

I AM a young person who wishes much for information; and as I know of no better means of obtaining it than through your agreeable and useful Recreations, &c. I take the liberty of engrossing a few moments of your precious time, and hope that you will either give this letter a place in your publication, or favour me yourself with answers to my questions.

Do you, Mr. Editor, who have thought so much and so well on advantageous discoveries and experiments for mankind, think that the manufacture of nettles into cloth can ever become beneficial to Great Britain and Ireland? May it not be the means of lessening the quantities of that troublesome weed, and giving the poor a habit of industry? By increasing country business, shall we not decrease the number

of idlers and dependants on charity, who abound so much in every parish? In England particularly, the soil of which is not so favourable to the growth of flax, as that of Ireland, may not the making of nettle cloth, if generally introduced, open new resources of comfort and cleanliness to the most indigent, and consequently security to the most wealthy? For, I believe, we may look upon it as certain, that the more we promote the comforts of the poor, the more also shall we promote their honesty. You will oblige me extremely by informing me whether the nettle of which chintz is made in India, is a different species of *urtica* from that which is so common in these kingdoms; and also if you can supply me with an account of the process of the nettle manufacture. I attempted it last year; but failed, either from ignorance or the neglect of those whom I employed, to the great disappointment of many of my poorer neighbours, who had flattered themselves with hopes of profit from this apparently unprofitable plant.

I have been greatly entertained by your account of the different species of polypus tribe; but find your account of the manner of the propagation of the sea anemone very different from observations I made some time ago, when living near the sea. I found numbers of this extraordinary animal sticking on all the rocks which were wet when the tide was in. The kind that I commonly found was of a deep red colour, and round the edge of the opening from whence the tentacula proceeded was a row of bright blue tubercles. I kept two of these in my room as long as I remained there, taking care to give them fresh sea water, and sometimes (very seldom indeed) indulging them with

some young shell fish; although somewhat hurt in taking them off the rock to which they were fastened, they continued in good health during my possession of them. After I had had them a few days, one of them brought forth a young one, which was about the size of the head of a large pin, but was formed exactly like the old ones; and every day for some time that old one produced another, so that soon my stock was increased to nine or ten. This seems to be a different mode of propagation from what you have mentioned; and, although you may be already acquainted with it, you will not think me impertinent, I am sure, for communicating it.

I hope you will soon favour me with an answer to my queries through your *Recreations*, of which I am a constant reader. The encouragement of such a man as you are, Mr. Editor, will be of great service to your humble servant,

JUVENIS.

In answer to the above queries, I beg leave to state that a very good cloth can be made of nettles, which possesses one quality that renders it valuable for some purposes. This, like most other useful discoveries, was made by accident. Some poor women, fishermen's wives near Leith in Scotland, gathered some nettles, steeped them in water like flax, dressed it, and spun it into coarse yarn, of which a kind of canvas was made. As their husbands were in the practice of dredging oysters, and sending them to Glasgow in canvas bags, some bags for this purpose were made of the nettle canvas, which was found to answer the purpose much better than that made from hemp, as it was much longer before it rotted. It should be

steeped and dressed in the same way as flax, but it requires to lie longer in water before it be fit to be dressed. It is harder to the touch than cloth made of hemp or flax.

That a useful filament may be obtained from the common nettle is thus established beyond a doubt; yet I doubt much if it ever can be made to answer the views of the benevolent writer. The nettle, were it to be cultivated for use, would be found to be very difficult to rear. Unless it be upon a very rich soil, it is a dwarfish plant; it would therefore be more difficult to obtain it in *quantities* than either flax or hemp; and the steeping of it requires a degree of attention and accuracy that I am afraid the description of persons he refers to could never be prevailed upon to bestow. I know of no cloth that is made in India of nettles. Chintz is made of cotton wool.

Varieties of the sea anemone, as well as of the polypus, admit of being propagated different ways, by slips, cuttings, and seeds.

[The signature above has been altered from a *Youthful Inquirer* to *Juvenis*, because a former correspondent had adopted the signature a *Young Inquirer*. It is the wish of the Editor that no signature that has been formerly occupied may be assumed by any of his correspondents.]

To the Editor of Recreations in Agriculture, &c.

SIR, *London* New Inn, 6th Dec. 1800.

I SHALL be much obliged to you if you will inform me, through the medium of your entertaining and instructive work, of the reason of a very

common custom practised in this and other parts of the kingdom, of placing the poker transversely over the fire when almost extinguished, in order to assist in making it burn; and whether it is any particular property in the iron that causes that effect, or, whether any other thing, for instance a piece of wood, placed in the same manner, would answer the same purpose. I should not have presumed to trouble you with this question; but, having inquired of several persons, without obtaining any satisfactory information, and not having in my possession any book which explains the properties of metals, I am induced to trespass on your well-known indulgence for an answer. Perhaps this request may cause a smile, on account of the apparent unimportance of the subject; but if it be considered, that there is scarcely any custom whatever (adhered to at this time) that had not its foundation in good sense, or in peculiar usefulness, it will not, I think, appear so very trifling; and I submit the question to your consideration, in order that the practice, if useful, may be more generally known.

Having been a constant reader of your work from its first publication, and having perused it with great pleasure, and I hope with some profit, I beg leave to congratulate you on the great success which I understand it has experienced. The communications of your correspondent Timothy Hairbrain have given me great satisfaction; I much regret, therefore, the discontinuance of his observations, and am particularly sorry that the conclusion of the elegant and well-told tale of the Recluse has not been inserted according to your promise.

I take the liberty of sending you the inclosed letter,

though I do not conceive the improvement to be so great as the reverend writer supposes; as it appears to me only to *increase the WEIGHT*, and not the quantity of the bread.

I am, sir, with great respect,

Your most obedient, humble servant,

AMICUS.

Observations by the Editor.

No question that respects any of the phenomena of nature can ever be deemed unimportant by persons of a sound understanding; nor ought any thing that presents itself under that form to be ever rejected without examination, merely because it may chance to appear to us absurd or incomprehensible; for we should thus close for ever the inlet to knowledge in many of its most important departments; a striking illustration of which I shall here beg leave to specify, as I had it from the late ingenious Dr. John Gregory of Edinburgh.

When Dr. Gregory was a young man, he studied under the celebrated Mr. M'Laurin, who was then professor of natural philosophy at Edinburgh. Mr. M'Laurin used to have two classes, one for boys initiating into that science, the higher class being appropriated to young men who had made a considerable proficiency in science, to whom he communicated all the important discoveries that came to his knowledge. One day the professor, with more than his usual solemnity, told his pupils, that he had received letters from an old and much-esteemed correspondent in Germany, which had made a deep impression on his

mind; for they contained information respecting some alledged phenomena of nature that his correspondent said he had observed, which were so extravagantly improbable, and he thought indeed so near to impossible, that he could not help suspecting that the intellects of his friend began to be deranged, and that he must have mistaken the phantasms of imagination for realities. He added, however, that the respect he bore his friend was such, that he was determined to try the experiments which he had recommended, as soon as he could get the necessary apparatus prepared, though his expectations of success were far from being sanguine. He then read the letters, which contained a neat and distinct specification of some of the phenomena of electricity, and the means by which these might be produced. Those who advert to the state of science at that time, when the very existence of the electric fluid was not so much as suspected, and to the astonishing nature of the phenomena produced by means so seemingly inadequate, will not be surprised if a first relation of these phenomena should be received with some degree of scepticism. The apparatus, however, was made; the experiments were tried; and, to the astonishment of them all, were found to succeed exactly as they had been stated: nor did the ingenious professor fail to remind his pupils of the doubts he had entertained, and to warn them to be cautious how they trusted to their own prepossessions in declining to bring to the test of fair experiment such facts as were stated by persons worthy of credit, however improbable the alledged facts might seem.

But while we ought to guard against an obstinate

pyrrhonism on the one side, we should be equally on our guard against a too easy credulity on the other: nor should we ever admit a fact as such until it be incontestably proved to be so. We should never forget, on such occasions, the story that is told, on an occasion of this sort, of king Charles the Second, who liked a joke as well as any man. As the story goes, this witty monarch proposed as a query for the royal society to solve, "What is the reason why a dead salmon is heavier than a living one?" When the day arrived on which this question was to be solved, the king himself attended to hear the arguments. A learned dissertation was read, in which much physical, and more metaphysical talents were displayed, to account for this *well-known* phenomenon. But equal ingenuity was exerted to invalidate those arguments, and to establish another hypothesis in place of the first. This was again refuted in its turn: and so on they went, without giving any indications that they were ever likely to come to a conclusion. At last a grave member arose, who had hitherto taken no share in the debate, and, addressing himself to the president, said, "Sir, I beg leave, humbly to doubt the fact; and therefore I move, that all farther arguments on this head be postponed until the fact shall be proved to the satisfaction of this society, by the undoubted evidence of clear and satisfactory experiment." "Aye," said the king, smiling, "had you begun with this, you might have saved yourselves a good deal of trouble; but at the same time you would have deprived me of a luxurious entertainment."

When an opinion prevails generally among the people

respecting a circumstance like that of the poker alluded to, it may be a good reason for directing the attention to that subject, in order to discover whether the circumstance stated be really and truly a fact (for we ought ever to recollect that many notions of this sort originated in the dark ages of superstition). This point ought to be first established by demonstrative evidence, before any attempt shall be made to account for it. I, therefore, recommend to my correspondent and all my readers to begin by establishing the fact, viz. that the laying the poker over the fire does actually promote the ignition; when that is done, they may then try to account for it.

With sincere thanks for the polite attentions of this obliging correspondent, and the public in general, he is respectfully informed, that the *Lucubrations* of Timothy Hairbrain have been deposited in the Editor's bureau for several months past, where they have been suffered to remain, merely in compliance with the wishes of some correspondents, who expressed a dislike to the continuation of them. Should it seem to be the wish of others to have that concluding paper, it shall be given.

The printed letter that was inclosed seems to have obtained already as great a degree of publicity as its importance deserves, and is therefore here omitted.

Index Indicatorius.

A Young Inquirer, after expressing the satisfaction he has derived from the elucidations that have been given in this work respecting the gooseberry caterpillar, expresses a warm wish that similar information might

be given respecting the means of destroying the other kinds of vermin that injure the produce of our gardens, particularly *slugs*, whose ravages, he says, have been peculiarly hurtful to him during the present season; especially with respect to his lettuces, which they have eaten up entirely, and have also committed great ravages upon cauliflowers, cabbages, &c. since they have been planted out in the spring season. He requests, then, as a particular favour, that some directions may be given on this head.

The directions that I should give on this subject would be by no means recommended by their brilliancy, for they would be all resolvable into the homely phrase, attention and care; but that care will prove more efficacious if *properly* applied than if it were given without due consideration and attention to the nature of the case. The clearing a garden from insects may be in many respects compared to the freeing it from seed weeds. It is a work of care and time, but it may be with certainty effected in most cases. In the one case as in the other they all spring from seeds, and if these seeds cannot be conveyed from a distance, the matter is best effected by taking care that the parents shall be destroyed as soon as they make their appearance, without allowing them to perfect their seeds. If this measure be steadily adhered to for a short time the very germ of life is destroyed, so that no trouble can be given but from a chance straggler who may gain access, and which may soon be hunted out and destroyed. With winged insects and downy seeds this is indeed a matter of more uncertain success, but with creeping reptiles, such as snails and slugs, it is always within our power if we choose it. I know

at this moment a garden of great extent which has not had one shilling damage done to it by slugs or snails for many years past, though in the gardens around they so much abound, that every season the crops suffer amazing damages from these insects, in attempting to destroy which perhaps some hundreds of pounds are annually in vain expended, though here not one shilling has been laid out for that purpose perhaps for thirty years past; for the same man has had charge of this garden for more than forty years, and the business was completely effected within a few years after he obtained possession of it. He is no churl of his secret, and here it is.

At the beginning this garden was just as much infested with these vermin as others. The snails were quickly eradicated by closing up all the holes in the walls, and picking them off with care as soon as they made their appearance in damp or cloudy weather. In about two years these were totally eradicated, so that not one could be found.

Slugs, as being less easily perceptible, and feeding more during the night, were not so soon overcome; but by carefully going over the ground very early in the mornings, especially during damp and cloudy weather, and picking them up clean, these also were soon sensibly diminished in number, and gradually disappeared. In this species of hunting the success will be considerably forwarded by due attention to the natural habitudes of the creature. That it feeds during the night, and comes out of its holes only in moist weather, is universally known; but it is equally certain, that though it has not the use of eyes, it has the faculty of distinguishing its proper food at a considerable

distance, so as to find the way to it with facility in the dark, probably by the smell. Its regale is decaying vegetables, and it scents them out with great acuteness. Hence it is, that newly transplanted cabbages or lettuces in the spring, or other such things, especially if they have been long out of the ground so as to become sickly, are sure to be seized upon with peculiar avidity, while such as are fresh are in a great measure neglected. When a plantation of this sort, then, has been made, it ought to be carefully examined early in the morning; and if a single blade has been touched the thief ought to be watched, nor ever abandoned till it has been caught, which is an easy task: for this animal is so slow in its motions as to have become the origin of a generic term, all creatures who have similar propensities being called *sluggish*. In ground that is foul, ten or a dozen will sometimes be found clustered round one such plant, while others will be seen crawling on the ground about it. These should be picked up, and perhaps no tool is better for that purpose than a gardener's knife with a long handle; for the point of it can get in among the leaves to brush them off without injuring the plant, and then by slipping it below them among the earth they may be very conveniently lifted, and thrown into an empty flower pot (having the hole closed up) held in the left hand for that purpose. In this way they may be quickly picked up, and by going over the whole division thus row after row during a moist cloudy morning, or in an evening after it has rained, few that have come abroad at that time will escape. This process ought to be repeated in the same place day after day, while the weather is favourable, as long as any can be found; nor

will it be long, if this be done, till they totally disappear there, if no shelter is left to conceal them; and here cleanliness is of sovereign use. Nothing is more common than in most gardens to allow leaves of cabbages to lie upon the ground, or decaying stalks of these plants to remain in their places. These serve as the most efficacious nurseries for this kind of vermin that can be conceived. Under these leaves they find shelter and food exactly suited to their taste, and here they batten and breed at their ease, without being obliged ever to expose themselves abroad at the risk of being picked up by any of those creatures which prey upon them; and in the hollow of a half-rotted stem, especially if covered with a mixture of decaying leaves and sprouts, as at this season of the year, they find such an appropriated shelter, that it is perhaps impossible to devise another situation equally favourable for them. Cabbages, therefore, and cauliflowers should always be taken up by the roots, not cut over when they are to be used, and carried clean off the ground; and other things, such as decaying turnips, beets, or things of a similar kind, should be carried off the ground the moment they are no longer in a fresh or prosperous state. By pursuing this conduct with care, which is no less necessary for economy than neatness, slugs will soon disappear.

I mention not here sea gulls, and other birds who prey upon these insects without eating seeds, because these cannot always be obtained; but where they can be obtained, and properly confined within walls, they are a very useful assistant. What is recommended above is in every person's power to obtain in every possible situation that can be supposed.

Decaying leaves, however, may be employed in foul grounds with great effect; for, if these be laid down in small heaps by way of snares, during moist weather, in the places where slugs most abound, they allure the insects thither, which may there be collected in great numbers in the morning, by removing the leaves, and then replacing them. If these heaps be not too small, and moistened with a copious watering during the evening in dry weather, they will prove then equally efficacious. If some stems of cabbages, or decaying turnips, be among them, the better. Where the ground remains in small clods, these afford an excellent shelter for slugs, who lodge under them during the day, and devour the young plants as they spring up during the night. Such ground should always be rolled with a weighty roller as soon as it is sown.

To *A. B.* who wishes to have my opinion respecting the kinds of trees that are best adapted to different soils and circumstances, I beg leave to state that my knowledge on that subject is too imperfect to admit of me to speak with the precision that could be wished to render it useful. Some hints will naturally occur in the course of this work respecting this subject; but they will be merely hints tending to elucidate the subject, not to direct the operator. In regard to the cultivation and uses of the larch tree, which I conceive to be in many cases the most useful and the most profitable tree that can be reared in this country, I have written very fully in the third volume of *Essays on Agriculture, &c.*; nor could I answer this gentleman's last query better than by referring to it.

[*Acknowledgments to Philo; I. F.; Juvenis Indigator; F. W.; Hafer; Aristides; Leucippus; F. G. &c. are still unavoidably postponed.*]

15.

M A Y 1800.

RECREATIONS
IN
AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 3. VOL. III.

AGRICULTURE.

Hints respecting the circumstances that require to be chiefly adverted to in experimental agriculture, particularly with a view to a proposal for instituting a national experimental farm.

[Continued from page 99.]

PRACTICAL REMARKS ON THE MANAGEMENT
OF THE DAIRY, PARTICULARLY IN RESPECT
TO THE OBTAINING OF BUTTER.

Some of the remarks that follow, on the dairy management, were communicated to the secretary of the agricultural society at Bath, and were published in the fifth volume of the correspondence of that society. As it is probable, however,

VOL. III.

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that that volume may not have fallen into the hands of many of the readers of this work, it will not, I hope, be deemed improper to give it a place here, even if it had been only reprinted without alteration; but the additions now made to it are such as to render it, in a great measure, a new work.

My idea respecting disquisitions on agriculture is, that nothing should be deemed perfect which can be rendered more so, and that this degree of perfection should be the object aimed at in every such disquisition. With this view, the circumstances that can tend to affect the particular department in question so as to augment or diminish the amount of the produce, or to improve or deteriorate its quality, ought to be, as much as possible, adverted to, in order that those who wish to improve by such disquisitions may be directed, not only how to act so as to derive the full benefit of all the knowledge that the writer himself possesses, but also that they may have their attention turned towards such unascertained circumstances as would have a tendency still farther to perfect the practice in that department, were they known. Thus will they be able to go on with intelligence in every step of their progress, and be continually advancing, by ascertaining some facts that their experience shall enable them to discover.

In taking a comprehensive survey of the business of the dairy with this view, we shall find that the subject naturally divides itself into many branches, which will best be considered in succession; the first that we shall take notice of, as being nearly connected with the subject treated in our last, is,

1st. *The choice of cattle for the purposes of the dairy.*

Here a question arises which has never yet, that I know of, undergone discussion. In consequence of the idea having so long prevailed, that all the varieties of cattle were originally derived from the same parent stock, it never was once suspected, that these varieties could differ from each other in regard to great characteristic distinctions. It was, for example, generally believed, that all sheep carried wool of some kind or other, unless in as far as (according to a vague notion that prevailed respecting the influence of climate) it had been affected by the climate. It has now been proved, that this notion is erroneous; and that in the same climate, and in the same field, may be kept sheep bearing fine wool, coarse wool, long hair, short hair, and many other diversities and different mixtures of hair and wool, for their whole life, and still retain their original characteristic differences. In like manner it was believed, that no kinds of cattle existed which carried a coat that could in any degree be compared to a fleece of wool; and it was also supposed, that the size of cattle necessarily depended on the scarcity or the abundance of their food, especially while young: these also have been proved to be equally erroneous with the former opinion. It was also, in general, conceived, that the greater or less delicacy of meat of the same denomination, such as beef or mutton, depended chiefly on the kind of feeding which the animal had had, sometimes in connexion with the age of the creature; but it was not suspected, that a

great diversity in this particular might arise from the nature of the breed: in like manner it was known, that some cattle gave more or less milk, and of a quality in proportion to their size richer or poorer; but it does not as yet seem to be imagined, that different breeds may yield milk which possesses qualities extremely different from each other, though I see very great reason to believe that this may actually be the case; and that therefore it behoves us to be on our guard, and carefully to attend to this particular. We know that the milk of those breeds of sheep usually reared in this country, differs very much from that of our common cows for many economical purposes. Ewes milk, for example, though fully as thick as that of cows, yields very little cream, and that cream gives butter of a quality greatly inferior to what is obtained from the milk of cows; but, on the other hand, the same measure of ewes milk will give more than double the quantity of curd that our cows milk affords. Goats milk, if my information be right, gives still less cream, and scarcely any butter, but a very large proportion of cheese, and little whey. Hence, for the purpose of the dairy, ewes milk can be much more profitably applied to making cheese than butter; and the same may be said of goats milk. Hence also it happens, that cheese is the principal produce of the dairy in Switzerland and other mountainous countries best adapted for the pasturage of goats; while in the Netherlands, Holland, and similar rich flat countries, butter is the staple article obtained from the milk.

I state these facts merely to show that the qualities of milk may vary greatly for certain economical pur-

poses, when that variation is not obviously indicated by its external appearance. It therefore behoves us to keep this circumstance continually in our eye in all our researches concerning the choice of cattle for the purposes of the dairy; as it is by no means certain, that some breeds may not give milk that may much more nearly approach the nature of that of ewes or goats than others. To shew the benefit that may on some occasions be derived from this kind of attention, I shall beg leave to state an accidental experiment which brought a circumstance of this kind to light, where it was not in the smallest degree suspected.

A friend of mine, who kept only a single cow for the use of his own family, bought in one (from a person who kept from fifteen to twenty cows, chiefly for the purpose of rearing calves, but in a subsidiary view for the dairy), which was recommended as an excellent cow that gave a large quantity of milk for her size, and that of a most excellent quality. This last was a circumstance of great consequence to my friend, who took care to taste the milk, and found it excellent, I believe before the bargain was finally completed. But, although that milk was thick and rich to the taste, it never could be made to yield one bit of butter, though they tried every method that could be devised for that purpose; on which account he was obliged very soon to part with the cow. Now, it chanced that this cow had given milk for three seasons before she was sold, without its having been ever discovered or suspected that her milk did not give as much butter as that of any other cow in the dairy.

This experiment proves, in the first place, that there may be individual cows among a great number which yield milk that possesses qualities extremely different from those in general of that breed, although to the eye and the taste it appears not to differ from them at all; and therefore it behoves every person who wishes to conduct this business with a proper degree of attention and economy, always to ascertain the qualities of the milk of every cow individually, as soon as she is turned into the dairy; otherwise he may, like the person to whom this cow originally belonged, be going on for years together, and never know that he is subjecting himself to a great expence daily, without drawing any return for it. Innumerable other benefits will be found to result from the practice of keeping each cow's milk separate as much as possible, and examining it individually very often; for not only may the milk of one cow be, upon the whole, of a much inferior quality to that of another, and yield a much poorer return, which might thus be discovered; but it also may so happen, that from casual disease, or other circumstances, the milk of one cow may become tainted at a particular time with a peculiar taste or other quality which may greatly injure the whole stock if it be mixed with it, and occasion loss and other unaccountable inconveniencies to the owner, which by this caution might be avoided: besides, he will thus avoid the danger of being induced, with that hasty decisiveness so common in rural affairs, to attribute the effects that arise from this unsuspected source to other circumstances that have had no influence whatever upon it. From these considerations, I should re-

commend it as an invariable practice in every dairy, to keep each cow's milk separate on the first day of every month at least throughout the year, for the purpose of ascertaining the quantity and quality of the milk yielded by every one of them individually. Were this practice strictly adhered to, it would advance the practical knowledge of the dairy more in the space of one year, than can be done in the random mode of procedure usually adopted in a century; because it would lay open to view innumerable circumstances of great importance to the welfare and prosperity of the owner that are not at present suspected, and that never can come to be generally known among this class of persons, unless something of the kind here advised shall be done. I shall have occasion to specify some of these circumstances in the sequel, that I know will be disregarded by many dairy owners, merely because they never have had an opportunity of remarking them. The case that gave occasion to this remark is a striking example; but there are many others equally unattended to, and which daily occur.

Of this nature I shall briefly beg leave to specify the following diversity that daily occurs among different varieties of cattle without being sufficiently adverted to. Some kinds yield a very large quantity of milk soon after calving, which continues to flow for a short time in vast abundance; but this flush of milk lasts only for a short time, like a horse without bottom, who sets off at the beginning of a journey with surprising alacrity, but soon becomes jaded and tired, and must have rest or he will die. Others, like a horse of true mettle, set off with less speed, but con-

tinue to make an equal progress as at first for a long while, so that, although the first greatly outwent him at the beginning, the last leaves the other a great way behind at the end of the journey; so some kinds of cows give nearly as much milk after having calved ten or twelve months, as during the first month after calving, if equally well fed. Such cattle would thus, and thus only, have their comparative value clearly ascertained.

In the second place, this experiment proves, that milk may be yielded by varieties of the same species of animals which may differ as much from each other in some of their economical peculiarities as the milk of our ewes differs from the milk of our ordinary cows, though to appearance they are not very different from each other. It may therefore happen, that among the varieties of cattle which exist, there may be some kinds whose milk would yield much less butter, and that of a worse quality than could be obtained from others, though that very milk might give a much greater quantity of cheese than the other, and that also of a much better quality. I do not assert that this is the case; for, unfortunately, my experience in regard to this particular has been equally confined as that of most other persons; I only say, that it *may be* the case; and that, therefore, this circumstance ought to be kept in view in all comparative trials on this head. This consideration, I believe, has never been once adverted to in any thing of the kind.

It is well known, for example, that the small Alderney breed of cattle affords, beyond dispute, a milk that yields a greater proportion of butter, and that also

of a richer quality, than the milk of any other breed of cows common in this country; but I do not know whether it has ever been ascertained, what are the comparative qualities of that milk in the production of cheese; or the proportion of milk given by these cows in respect to their size and the quantity of food they consume when compared with others. It is, I believe, a very general opinion, that such milk as affords the richest butter will also necessarily produce the best cheese; and *vice versa*. We have already showed, that this is not a *necessary* consequence; and therefore the fact requires to be proved before it be admitted. It has also been supposed, that the milk which contains the greatest quantity of butyraceous or oily matter will necessarily afford the richest cheese; by which word, *richest*, I suppose is meant that which is most pleasant to the palate, and that has most the appearance of butter when put to the fire. This fact also requires to be proved, which I think will not be an easy matter; for I have seen cheeses that were made from milk only, which ate richer and more mellow than others that were made entirely of cream. We are in all cases disposed to be too rash in our conclusions. There are, doubtless, cheeses made from materials that have as little oily matter in them as the Suffolk cheeses, which have nothing of their horny hardness; other circumstances tend to produce this effect.

I shall only farther remark on this subject, that different kinds of milk may also vary from each other in respect to the qualities of the residuum that remains after the separation of the butter and the cheese. But

it is sufficient barely to bring this into view, without enlarging upon it; for I am afraid of tiring the reader with these niceties, as by too many, I am inclined to suspect, they will be deemed: leaving these then for the present, I return to some other particulars that are so plain as to be within the reach of every dairy-owner in the kingdom.

It is well known, that among every kind of cattle in the kingdom there are found individuals that give a much greater *quantity* of milk than others of an equal size: it is also known, that there are some cows that give much *richer* milk than others do. These two facts are universally recognised and admitted among all who concern themselves with dairies. It is also equally well known by them and by graziers, that there are some beasts which feed more kindly than others, and fatten sooner upon the same pastures: but it is not so universally recognised as a truth, that individuals may be found that give at the same time a great quantity of milk, and that of the richest quality, and fatten as easily, and are as hardy in all respects as any others. This fact, however, I have already stated, and I venture to state it once more as a truth; nothing afraid that it will ever be contradicted by experience, when the business of the dairy shall come to be conducted with the necessary degree of accuracy and precision: to which I beg leave to add, that these qualities, whenever they are found, are transmissible to the descendants of the beasts which possess them, among which descendants, by a proper degree of attention, these valuable qualities may not only be prevented from degeneration, but may be kept on for

an indefinite length of time in a state of progressive improvement. If it should chance that the statements I now give should be well founded, Who can pretend to say what would be the difference in the total amount of the produce of the dairy throughout Great Britain, should the time ever arrive when an attention to this article shall become universal? I shall not pretend to estimate it; but I have no hesitation in saying, that the dairy produce would in this event be more than doubled; and all this not only without augmenting the expence of the dairy, but even, in all probability, by diminishing it.

According to the present practice, a dairy farmer, who relies in general upon the common market for a supply of stock, not only does not obtain the best cows with respect either to the quantity or the quality of the milk, or the kindly feeding of the beast, but the very refuse of all these; for who that has cows to dispose of will sell the best while he has others of inferior value that are to appearance in a market equally good, if he has any occasion for such himself? No one. The dairy farmer who goes to market for his cows must, therefore, be contented to put up with the worst; and, as the breeder considers the milk (farther than for show) as an object of small account, he bestows little or no attention on the circumstances that I have above stated. Thus it happens that these circumstances are unknown, because no one feels himself strongly interested to observe them. Were dairy farmers universally to breed their own cattle, the case would be quickly changed: each of these would then find himself directly profited by the improvement of his breed,

and this interest would awaken his perceptive faculties in a surprising degree. It was with a view to stimulate some enterprising individual to enter upon this career, that I stated with so much precision my own experience, as well as that of Mr. Farquharson of Invercauld, both which have been abundantly successful. Nature never intended that I should engage in any warm pursuit for the accumulation of wealth myself: it was ever, to me, a secondary object. But there are not wanting men in Britain who account this an object of primary importance; and I should reckon myself very fortunate if this paper were to fall into the hands of such a person in the dairy line; for I do not know a more certain mode of obtaining, in the most honourable way, a handsome fortune to his family than this might afford, while he would at the same time confer a very important benefit on the country; and the means of effecting it, to a person of moderate talents, with the disposition above stated, are not difficult. A very few hints on that head will suffice to put him into a proper train.

Let such a person, in the first place, mature his plan in his own mind, without communicating his secret to any one. This is not a matter of indifference, but of the highest importance; and if it be not adverted to, he certainly will not succeed. He is to have his eyes open, but his mouth shut, upon all occasions respecting this object. His experiments must be made in a silent manner, and with care. When he has thus at last discovered some individual breed possessing in a high degree the qualities that he wants, he must, if possible, conceal the origin of that breed from every

one; and if he takes care to say nothing about it at the beginning, but buys in about that time several sorts from different parts of the country, this may be easily managed. He must take care to obtain some of the very best cows, and a bull of the favourite breed, of his own raising as soon as he can. He is then to breed in and in, according to Mr. Bakewell's plan (for he can follow none better); but he is still to be at great pains to select the best, and say nothing of his own breed or their excellence in any respect. In this way he is to go on till, after several generations of his beasts, he has raised this improved breed to a much greater degree of excellence than it originally possessed, still trying to conceal his secret. But secrets of this kind cannot be long concealed. Servants will boast of the fruits of their exertions; and neighbours will acquire some knowledge of superior profits derived from whatever source, and will make their comments upon it. The more these profits are attempted to be concealed, the more narrowly they will be investigated, and the more clearly they will be developed: a mysterious retention is, therefore, in this case of the most important consequence. It answers better than a hundred advertisements. It sets to work a thousand prying commentators, all of whom are unceasingly busy, and with exaggerations that no man dared to adopt himself. All is now as it ought to be. The harvest approaches, and the retention and attention of the undertaker ought to be redoubled. Neighbours will become anxious to purchase—he has no desire to sell—he will not sell—he must be tempted by high prices—even then the worst only of his breed

must be sold. The higher the price, the more the breed will be esteemed, the wider it will spread, and the more quickly it will be diffused through the kingdom. I give this, not as a fanciful dream, nor with any ironical allusion, but as a serious advice the result of many years attentive observation; nor is there any plan for raising a respectable fortune in a rural situation (if it be conducted by a man of discernment and prudence), the success of which is so infallible. Would to God that all plans for accumulating wealth to individuals were equally beneficial to the public!

Under this head, I shall only farther just take notice of one hint that occurs in the agricultural survey of the county of Middlesex, in which the writer states the uncommon quantity of rich milk that was yielded by the produce of a cross breed between one of our common cows and a buffalo that was obtained by the late Mr. John Hunter at his farm at Earl's Court near Kensington, while the creature is said to have retained an uncommon propensity to fatten easily. This statement should direct the attention of the improver to crosses of this sort. I now proceed.

2d. *Kind of food, and mode of feeding cows for the dairy.*

Grass, such as springs up spontaneously on sound meadow land of a good quality, is in general deemed the best food for cows that are kept for the purposes of the dairy. A meadow of this description, it is well known, consists of a great variety of plants, some of which must doubtless be more proper than others for this purpose; but few experiments have been made to

ascertain their respective qualities. It is about thirty years since I published a volume of essays consisting of miscellaneous disquisitions, doubts, and queries, respecting various objects in agriculture (Essays on Agriculture, &c. Vol. II.); and, among others, a considerable proportion of it respected the best food, &c. for dairy cows; to that work I beg leave to refer the reader who wishes to be informed how little of the much that is wanted is as yet known on this head. I am sorry to say, that although the abovementioned book has had a pretty extensive circulation, little has been added to our stock of knowledge since that time: the few facts, however, that have been since ascertained have been incorporated in the last edition of that work. All that is necessary to be here said on that head is, that rye grass is almost the only *gramen*, properly so called, that has been cultivated on such an extensive scale as to admit of its qualities being fully ascertained: that the *poa* grasses form among the richest pile for pastures; but no method has been as yet devised for separating the seeds with facility, so as to admit of their being cultivated by the common farmer on a large scale: that the seeds of the *Festuca* tribe may indeed be easily obtained, but have never yet come to be cultivated as a general crop; and that meadows for the purpose of dairy pasture now, as formerly, are chiefly indebted to accidental circumstances for their excellencies and defects: that broad clover has been cultivated on an extensive scale for being cut, but not for pasture: that white or Dutch clover has been extensively cultivated both for being cut and pastured upon: that yellow clover has also

been pretty much employed in some districts: and that sainfoin has been long profitably reared on calcareous soils: that lucerne has been cultivated with profit in a few favoured patches: that narrow-leaved plantain, or rib grafs, has been in some cases sown in pastures; and that these are nearly all the plants that have been artificially cultivated by the farmer under the name of grafses; all of which have been found to furnish excellent food for dairy cows under proper management. Turnips, cabbages, and many other succulent kinds of food, may be employed with singular benefit in the dairy, of which notice will be taken under some of the following heads.

[*To be continued.*]

NATURAL HISTORY.

ON THE TRANSFORMATIONS, &c. OF INSECTS.

[*Continued from page 114.*]

Of the Domestic Moth, that eats woollen goods, furs, &c.

THIS insect, which is so troublesome to careless housewives, and to those who deal in fine furs and woollen goods, is the larva of a small lead-coloured moth, which is so well known as to need no particular description in this place. The larva is a caterpillar of a particular kind, being one of those endowed with the peculiar faculty of making for themselves a complete suit of clothes, which is more ne-

cessary for their existence than clothing even for man; for in no situation can the animals of this class subsist without it. The whole tribe of insects whose larvæ require this kind of clothing are called by naturalists *Tineæ*, of which the diversity is very great; some living on leaves, as the *Tinea seratella*, of which we lately took notice; others live in the water, some of which form clothing of a most grotesque appearance, and others in various substances, too much diversified to be here enumerated. The present memoir will be entirely appropriated to the transformations and habits of the woollen moth, and the means of freeing ourselves from its destructive operations.

The food as well as the clothing of this species of caterpillar is wool, or animal fur of other sorts; for the habits of all these are so much alike, that they may be all considered in an economical view as exactly the same; and the parent is of course directed by a natural instinct to deposit its eggs in these substances, that the young may be enabled to find what is so necessary for its subsistence and existence as soon as it comes into life. It deserves, however, to be particularly remarked, that wool in its *natural* state is totally unfit for the purposes of this creature. In that state, wool is always strongly impregnated with the matter that perspires from the sheep; which is so noxious to the *tinea*, that it can by no means be prevailed on to take up its residence among such wool. While in this state, then, wool is entirely guarded from danger. But, as the very substance that preserves wool from the moth, renders it incapable of receiving any dye, and unfit for almost any of the purposes required in

manufactures, it becomes necessary to cleanse the wool from that grease before it can be used; and from that moment it is subjected to the ravages of this destructive insect.

The little caterpillar no sooner quits the egg, than it begins to form a suit of clothes for itself. For this purpose, after having spun a very fine coating of silk of the most delicate fabric around itself, it cuts the filaments of the wool or fur on which it finds itself placed close by the skin or thread of the cloth, by means of a pair of teeth with which it is provided for that purpose, which act precisely like scissors, and which it employs with great dexterity. It then cuts it into convenient lengths, and applies these pieces one by one, with great alertness and dexterity, to the outside of its silken case, to which it fastens these filaments by means of the silk that it spins from its bowels; applying others above it, and fastening them in the same manner, until it has thus covered the whole of its case to a convenient thickness. Its covering being thus formed into the shape of a hollow tube as long as the body of the insect, it takes up its residence in it; nor ever quits it but in cases of the most urgent necessity. When it wants to feed, it puts out its head at either end of its case as best suits its convenience, and helps itself. When it wants to change its place, it puts out its head and its six fore legs, by means of which it moves forward, having taken care first to fix its hind legs firmly into the inside of the case, so as to drag it along.

In this way it lives, until by the augmentation of its size its case becomes too small for the body, which

is first experienced in regard to its length. When this is felt, it begins by making a small addition to the silken case at one end, and immediately proceeds to cover it with wool as at first. It then turns itself within the case, which is always wide enough *in the middle* for that purpose, and then it makes a similar addition to its length at the other end also, so as still to preserve the widest part of the case exactly in the middle; and after the same manner it makes every successive addition.

The progress of this insect in its operations may be clearly and beautifully made manifest by transferring it from a cloth of one colour to that of another of a different colour; for, as it always employs the materials in the state it finds them, every fresh addition that is made to the case thus becomes conspicuous, from its being of a different colour from the former parts of it. Suppose the original parts of the case were formed on a white cloth, then transfer it to a scarlet, and the case would soon appear to be a white cylindrical tube, with a small ring of scarlet edging at each end. Let it then be transferred to a black cloth, and a ring of black at each end would be formed beyond the scarlet; then another of green, or any other colour you choose; and thus you may form as many, or as few rings as you please, of greater or less breadth in proportion to the length of time you suffer it to remain upon each colour of cloth.

But the case requires in time to be enlarged in respect to its width as well as its length: nor is this insect any more at a loss to accommodate itself in regard to this particular, than the other. With this view it

begins by making a slit in the case lengthways, proceeding from the centre towards one of the extremities. This it performs with great neatness and dexterity, by means of its scissor-like teeth. The opening being made, it instantly proceeds to fill it up with a thin stripe of wool externally, and silk internally, exactly after the same manner as it forms all the other parts of the case; and this longitudinal stripe can be as distinctly observed as the rings at the ends, if the creature be put upon a cloth of a different colour from that on which it had formerly subsisted. This rent being thus closed up, it then makes another longitudinal slit on the same end of the case, and after the same manner as the former. In many instances, this slit is directly opposite to the first; but in this respect it does not proceed with an undeviating constancy, as it sometimes approaches the former slit more nearly on one side than the other; but it seldom fails to make two slits on the same end, and to fill them up before it leaves it: then, turning to the other end, it repeats the same process exactly in all its parts.

In this manner it proceeds with great constancy and regularity, always enlarging its case in proportion to its growth, until it has attained its full size, which is about half an inch in length; and when, like all other caterpillars, it prepares for its change into the chrysalis or pupa state, it begins, as usual, by abstaining from all kind of food, and remaining in its case enveloped, while in its chrysalis state, in a small cocoon of silk which it spins for that purpose. From this it issues forth in about the space of three weeks in the state of a small winged nocturnal moth of a silver grey

colour, with a black point in the middle of each wing, well known to every one, in which state it is incessantly occupied in searching for proper substances on which it may lay its eggs; the consequences of which are so well known to every attentive mistress of a family, that they are beheld with horror, and killed without mercy wherever they can be found.

This insect may be called an annual; for the eggs are hatched, and it undergoes all its changes with great regularity in the course of the year; being in its fly state usually in the month of August, in which state it lives a few weeks. As a voracious caterpillar, it usually subsists about ten months.

The food of this larva, as well as its clothing, as has been said, is wool, hair, or fine fur, or feathers, all of which it equally devours; and the ravages it commits among furs, or fine woollen goods, are well known to be very great; so that it has exercised the ingenuity of many persons to discover a mode of destroying the vermin, and guarding these valuable articles from their attacks: nor has that ingenuity been exerted in vain, as several modes of destroying the insect without endangering the goods have been discovered. Of all the poisons that have been tried, no one has been found to be so efficacious as oil of turpentine, the smell of which alone, when moderately strong, infallibly and instantaneously kills them; but, unfortunately, the smell of that drug is so penetrating as to be very overpowering to the human senses, and extremely disagreeable to most persons. On this account, it must be resorted to with some degree of caution; though it is by no means accompanied with danger; for it is not necessary that the goods should

be sprinkled with it in substance, though that practice may on some occasions be eligible; for it has been found, that that drug does not affect any colour on woollen stuffs; except rose colour, which it injures in a small degree. All other colours, and white, are by no means affected by it. But if the goods which are infected with this *Tinea* be put into a close place, along with a saucer or other open wide-mouthed vessel filled with oil of turpentine, when the air is moderately warm, the vapour that rises from it will be sufficient to kill them, especially when they are young. If the caterpillars be old and strong, it may be sometimes necessary to put some of the oil of turpentine upon the stuffs themselves, which it will not at all injure, unless they be of a rose colour; and the easiest and best way of doing that is, to dip the points of the hairs of a common clothes brush lightly either into the turpentine itself, or into turpentine dissolved in spirits of wine, and then brush it along the cloth till it be dry. If this process be performed some days before the stuffs are to be used, and they be afterwards hung out in the open air, the smell will go off.

The smoke of tobacco also kills this insect, though it does not operate so powerfully as the turpentine; but, as that smoke is apt to sully several colours, it is not of such general benefit as the other; yet it may be employed advantageously on some occasions that ought not to be overlooked.

It has been already remarked, that these insects never feed upon unwashed wool; and such an aversion do they discover to this substance, that they always abandon the place where it is, if they can, though

they are not killed by it. Some persons having observed this loathing of unwashed wool, have employed it with success for banishing these troublesome vermin from them: for this purpose, they either lay their cloth between layers of that wool, and, after letting it stand thus for some time, take it out, or rub the cloth hard with some of the unwashed wool, which being thus strongly impregnated with the smell, the moth avoids it carefully until the smell be dissipated.

But not only is this insect destroyed by a strong smoke of tobacco; it is also killed by a decoction of its leaves: and it would appear, from some experiments made by a Mademoiselle de Métivier, of Bourdeaux, that wool or cloth that has been once steeped in such an infusion is so disgusting to these insects for a long time afterwards, that they will on no account touch it. Wool that has been so steeped takes as good a dye as if it had not had that preparation, unless it be pink colour, which is somewhat altered by it. Stuffs thus prepared may, therefore, be preserved from its attacks.

Many persons content themselves with taking out the goods that are attacked by the moth grub, shaking them, and exposing them to the open air from time to time. This, doubtless, is of some service, as this insect delights in a close, smothered, obscure situation, where it thrives in the greatest perfection; and consequently it delights not in the open air: but shaking, unless it be done very carefully, and at a particular season of the year, produces very little effect; for it usually takes care to fix its case so firmly to the cloth by means of silken threads at each end, that it ad-

heres to it too strongly to be thus detached from it; unless when the grub is yet in its earliest infancy, and still very small, when they adhere so loosely as to admit of being shaken off with greater ease. This operation, then, ought to be performed about the beginning of September, when the larvæ are yet young. This is also the most proper season for destroying them by means of smoke or odours; for, as the season of the fly is then past, there is no risk of eggs being deposited upon the goods from that time till the next season.

The loosest fabrics of cloth, such as baize, blankets, and fleecy hosiery, are preferred to those in which the threads are more twisted. If a piece of camblet and baize are put equally within reach of the grub, they will scarcely ever attack the camblet.

One other singularity that seems to be peculiar to this insect remains to be noticed. Its excrements are invariably of the same colour with the material on which it feeds, whatever it may be; and, whatever has been the dye employed for producing that colour, it does not seem to be in the smallest degree altered by the animal process in passing through its body. If it be placed on a scarlet cloth, they are scarlet; if a blue cloth, they are blue; and so on; and always precisely of the same tinge of colour with the food. From this peculiarity it would seem, that this insect might be usefully employed by man in the preparation of pigments; and it is probable, that the colours thus obtained might possess qualities that belong to none other, so that it is a proper object for experiment. Instead of lake obtained by precipitating a solu-

tion of cochineal by means of allum, a much finer colour might probably be obtained from the fæces ejected by this insect when fed upon the purest scarlet. Had this pigment no other excellence, the very superiority it would possess in point of fineness of comminution would render it peculiarly desirable. It is said too, that these colours mix equally well with water or with oil: thus, therefore, might be obtained greens and blues of the most beautiful tints in a state of perfection, which cannot be obtained by the help of other pigments. But those tints which promise to be still more desirable than any other, are the fine white and black pigments that might be thus obtained, and which would blend with all other colours in such a way as to give them a general harmony that, perhaps, cannot be produced by any other object in nature. This promises also to supply a desideratum that has been long searched for in vain as of inestimable value. It is a fine opaque white for water colours; a white too which may be made of any tinge that may be wanted for the particular purpose in view: for there can be no doubt that the white produced from the silver hairs of an aged person would be of a very different tint from that yielded by the flaxen hairs of a child. The same may be said of black. In this way also, if ladies must have colours for improving their complexion, they might prepare these for themselves (without being obliged to go to a shop for them) which would be at the same time of infinitely more beauty of tint than any that they can purchase, and free from those deleterious qualities to which the health, and even the lives, of so many amiable females fall sacri-

fices every day in this huge metropolis. The pearly hairs of a grandmother might thus become the means of augmenting the beauty and saving the life of the grandchild, by affording a pearl white of a delicacy of tint, and bland harmlessness, that cannot be equalled by any chemical preparation. To assist those who wish to engage in this set of experiments, I shall make a few observations.

It ought to be remarked, that every colour that has been produced upon the substance on which the animal feeds, by means of a dye, must of necessity be lighter in the pigment thus obtained than it appears upon the dye; for this good reason, that as the dye only covers the outside of each filament, without affecting the heart of it, which still continues of its native white; and, as the whole of the filament is eaten by the animal, it follows that the white of the heart blended with the dye of the surface of the filament must render the colour of the pigment always paler than the dye. The experimenter, therefore, if he wishes to have the full power of effect, must always choose deep shades of the colour he aims at. From the same considerations, it will appear obvious, that the finer the filament on which the creature feeds, the nearer will the pigment approach to the depth of shade of the dye; because in a large filament the internal parts of it will bear a much greater proportion to its surface than in the fine filament. If, for example, horse's hair and coney wool were dyed in the same vat, and of the same shade of any colour, the pigment thus produced from the coney wool would be of a much deeper shade than that obtained from the hair. Hence it will always be advantageous to

make choice of the *finest* materials that can be obtained in making these experiments.

Of course also, the black that is obtained from *undyed* black filaments will be purer and deeper (if the original black has been good) than can be obtained from filaments that have acquired their black tint by means of dying. The same observation will apply to undyed filaments of every colour that can be obtained. Hence the pigments made from native *feathers* of brilliant colours will be by far the richest that can be obtained. In this case, however, I proceed on the supposition, that all these native-coloured filaments are of the same colour internally as on the surface; but I do not know whether this has ever been experimentally proved to be so.

Nothing more need be added on this subject, unless it be to observe, that shearings of cloth, which is an article of no use that I know of at present, would be at the same time the best and the cheapest material for this manufacture; and, although it may appear to some persons, that the quantity of pigment that could be thus obtained must be very little, because the creature is itself of such a small size; yet these could be easily multiplied to such a degree, as to make the aggregate mass very great. Indeed, it could always be increased in proportion to the quantity of food furnished to them; so that all the wool and hair, and feathers and fur in the kingdom could be thus applied if necessary, and if it could not be applied to other more valuable uses. Many articles of dress and furniture, it is obvious, could be applied to this use after they are totally unfit for any other purpose whatever, except to be thrown on the dunghill.

This is the *Phalæna Tinea pellionella* of Linn. *Syst. Nat.* page 888, n. 372. Linnæus describes three other species of *Tinea* equally destructive to woollen cloths and furs.

To the Editor of Recreations in Agriculture, &c.

SIR,

THERE are few things that appear to me so well calculated to afford an innocent recreation to the mind, as that of contemplating the objects of nature; and, though I have made but little progress in this study as yet, I feel that every step I advance, the pleasure it affords is the greater. The mind, when delighted, expands; and, when one is much pleased, the wish that others should participate in it is so strong, that one feels that pleasure divested of half its charms, if no one is to be found to whom it can be communicated. Such a sensation I strongly felt on reading lately an account of two little birds, which appeared to me so interesting, that I could not help transcribing it, with a desire that others might participate with me in that pleasure, and if you will be so kind as to give it a place in your valuable miscellany, I shall take it as a particular favour. The author from whom I borrow it [Mr. Bonnet, in his *contemplation de la nature*] was a serious man, and a very acute observer of nature. The birds, he says, were a species of paroquet, known among bird fanciers by the name of *Guinea sparrows*,* and had been carefully observed for many years by a solitary gentleman, whose principal delight had been in observing the unsophis-

* *Psittacus pullarius*, Linn. *Syst. Nat.* page 149, n. 45.

ticated conduct of animals, and in contrasting them with the corrupted manners of man, which, in many instances, deviate so widely from those of nature. Excuse this trouble from

A YOUNG OBSERVER.

An instance of the conjugal affection of a pair of Guinea sparrows.

These two little birds were lodged in a square cage, such as are usually appropriated to that species of bird. The cup which contained their food was placed in the bottom of the cage. The male was almost continually seated on the same perch with the female. They sat always close together, and viewed each other, from time to time, with a tender air. If at any time they separated, it was only for a few instants, for they hastened to return and place themselves in their favoured position close to each other's side. Together they went to take food; and no sooner had they satisfied this want of nature, than they hastened together to the highest perch of the cage. From time to time they seemed to begin a sort of conversation, which they continued for some time in a low voice, and seemed to answer one another; they even varied the sounds in these little conversations, elevating and lowering their voice occasionally during its continuance. Sometimes they even seemed to quarrel; but these little quarrels were but of a momentary duration, and always terminated in additional tenderness, in which they were emulous who should most excel.

This happy couple passed thus four years of their life in a climate greatly different from that in which

they were born: but, at the end of that term, which was seemingly a long while for that kind of paroquet, the female fell into a state of languor, which had all the appearance of old age; her legs swelled, and there appeared upon them knots, as if the disease were of the nature of the gout. It was no longer possible for her to go to take her food as formerly; but the male, ever attentive and alert in whatever concerned her, went and brought it to her, carrying it in his bill, and emptying it into hers. He was thus her vigilant purveyor during the space of four months entire. The infirmities of his dear companion, however, increased every day; at length she was no longer able to sit upon the perch; she remained crouched at the bottom of the cage, and from time to time made a few useless efforts to regain the lower perch. The male, who remained perched close by her, seconded these her feeble efforts with all his power. Sometimes he seized with his bill the upper part of her wing, to try to draw her to him; sometimes he took her by the bill and tried to raise her up, reiterating his efforts for that purpose many times. His movements, his gestures, his countenance, his continual solicitude; every thing, in short, indicated in this interesting bird the ardent desire to aid the weakness of his companion, and to alleviate her sufferings. But the spectacle became still more interesting when the female was upon the point of expiring. Never was there seen among birds a more moving scene. The unfortunate male went round and round the expiring female without ceasing; he redoubled his assiduities and tender cares; he tried to open her bill, with a view to give her some nourishment; his emotion increased from

instant to instant; he went and returned with the most agitated air, and the utmost inquietude; at intervals he uttered the most plaintive cries; at other times, with his eyes fixed upon the female, he preserved the most sorrowful silence. It was impossible to be in a mistake concerning these expressions of his grief; I had almost said, of his despair. The most insensible heart would have been moved by it. His faithful companion at last expired; he himself languished from that time forward, and survived her only a few months.

MISCELLANEOUS LITERATURE.

Thoughts on the circumstances which constitute the essence of grandeur and sublimity in artificial structures.

THE legitimate province of the rational faculty with which man is endowed, I conceive to be nothing else than to investigate facts that fall under his cognisance, to compare them together, to mark their influences respectively, and to draw the conclusions that these will authorise.

The errors into which we are so liable to be betrayed in the exercise of this faculty originate chiefly in the carelessness with which the facts whereupon it is to be exercised are investigated, the difficulty of ascertaining them with the necessary precision, and the danger of our falling into mistakes concerning them.

The man who is the most careful in examining his facts, and the most accurate in authenticating them, will in general form the most correct conclusions; and him we call judicious. He who is the quickest in comparing and combining those which present themselves to him, and the most rapid in deducing conclusions, is said to have talents. These two faculties are by no means necessarily conjoined; and thus it happens, that men of talents are not always men of solid understanding.

The mind obtains its perception of physical objects through the intervention of the corporeal organs of sense. The qualities of these objects are susceptible of being ascertained by means of experiments properly contrived; and when they are thus ascertained, they can be described with such accuracy as to convey the same ideas to any number of persons who have taken the pains to make themselves acquainted, by a careful examination, with the circumstances that can affect the nature of the objects in question. Hence, a patience of research, and a mind capable of an intense application, are qualities that must necessarily insure a progress in this line; and every day that a man thus qualified lives, must tend to augment his knowledge.

In regard to objects of taste, circumstances are very different. Instead of facts that may be examined, sifted, and analysed by palpable experiments, and which thousands can judge of with the same degree of precision as any one among them; the man of taste has only mental perceptions, the mere instinctive feelings of the mind, which are to serve as the basis of all his reasoning. These are, indeed, the only facts

to which it is possible for him to resort for every illustration on this subject: but, as the instinctive feelings of one person are affected very differently by the influence of a certain object, from what those are in another, it follows, that the facts which are palpable and undeniably certain to one person, may not be at all perceptible to another; and of course can never have their certainty proved to his satisfaction. Hence the origin of those endless and unsatisfactory arguments respecting objects of taste which every day occur in society. There are other sources of misapprehension; but it is unnecessary to our present purpose to take notice of them.

The use I wish to make of the above illustration is, to recommend to every person, in all disquisitions respecting objects of taste, to fix their attention, in the first place, on the facts that are to serve as the basis of the reasoning; that is to say, on the perceptions or feelings of the person who is endeavouring to communicate his ideas, or, in other words, the impressions that the primary objects make upon his mind; and if you can thus observe that these impressions have been of a nature very different from what the same objects have made upon your mind, there will be little hope that you can ever come to understand each other: but if you yourself feel a strong instinctive impression from the object, whether of approbation or the reverse, while the other praises or condemns it simply in consequence of cool reasoning merely founded on abstract principles, then instantly withdraw from all kind of discussion; for, in that case, it is as impossible that you can ever come to have the same ideas with him

respecting it, as it is to make light and darkness occupy the same space at one instant of time. Abandon it then as a vain attempt, that can only end in disappointment and chagrin.

And that others may be able to judge of you also when you take the lead in such discussions, in regard to this particular, and be able to know what course they ought to observe with you under similar circumstances, common politeness ought to dictate, that instead of bluntly declaring the complex opinion you have formed of any object of taste, which may be either merely the result of feeling, or of reasoning only, or of both of these combined; it will be incumbent on you to begin by stating simply your original perceptions, and then you may subjoin, if you please, the consequences you deduce from them by reasoning; by which mode of procedure you will enable them to perceive whether your perceptions and theirs accord; that is to say, whether you are both blind, or whether you both see; or whether one have eye-sight and the other none, and of course can determine in what manner the conversation ought to be conducted. It is upon these principles that I shall endeavour to conduct the present disquisition.

The first artificial fabric I ever saw that impressed my mind with an instinctive and forcible impression of grandeur was a hay-stack. I was then very young, perhaps twelve or thirteen years of age. I had been carried by a friend to see a fine house, that was built in a style of elegance which I had never before seen, with paintings, gildings, and the other ornaments usual on such occasions; but, unluckily for the fine

house, the hay-stack stood upon the lawn before the door, and it had taken such a forcible hold on my mind, that whenever I came to a window from whence it could be seen, it drew off my attention from the paintings and gilding and all the fine things, so that they were scarcely noticed. I was no sooner at liberty than I went round and round the stack, examined it in every position, and could scarcely be prevailed on to leave it till it was dark. I had never till then seen an object that conveyed any such idea of grandeur to my mind; nor have I ever since that time seen any one that made such a powerful impression upon it.

Many hundreds of times have I asked myself since that period, whether I could fix upon the circumstances that occasioned this kind of sensation. Novelty might have had its share; but then novelty (if that alone had produced the sensation) ought to have had a much greater power in making me admire the house than the hay-stack; for the house much farther excelled other houses that I had seen in brilliancy and splendour, than the hay-stack excelled many others that I had seen in these respects. In magnitude and uniformity alone the hay-stack far exceeded any thing of the kind that I had ever beheld. I therefore conclude, that it was the magnitude of the object, and the simplicity of its parts, which produced that irresistible impression on my mind.

A servant who attended seemed to participate in the pleasure of my sensations; he had the goodness to go along with me, nor ever tired in answering the many questions I asked; and every thing respecting it ap-

peared to me so sublime, that I took down the dimensions from his mouth, which I never lost, and here they are:

	Feet.
Length	400
Width	40
Perpendicular height to the eaves	40
Perpendicular height from the eaves to the top	30
Length of the sloped side of the roof	40
Total height to the top	70
Width at the eaves where the roof began to slope inwards	42

The base was an exact parallelogram. The sides built as even and as true as a wall of masonry, the slope outwards, being one foot in forty, quite regular. The ends were carried up with the same equal slope outwards to the top. The roof was covered with thatch about one foot in thickness, very regularly laid on, which projected over the eaves, where it was neatly cut with an uniform *talus* like a cornice. The thatch was secured by means of straw ropes, which were placed exactly at one foot distance from each other along the whole from end to end. These went over the roof, and were brought down the sides in a perpendicular line, where they were all fastened in one horizontal line at the precise height of twenty feet from the ground. On the top of the roof at each end was stuck a stick in the form of a cross, about two feet high, or rather, I believe, a little of the thatch twisted round with a rope of straw, so as to give a neat finish to the whole. The stack had been built in every part of it with the greatest care, so as to have no sort

of deformity, but the utmost symmetry and neatness every where; and it was placed in the middle of a level lawn of about twenty acres in extent, surrounded with fine trees. I describe it thus particularly, that the mind of the reader may be able to grasp the idea as nearly as possible; but I must tell him, that it was a pile of such immense magnitude, when compared with any thing else he has ever seen, that he can form no idea of it at all; at least I could not, if I had not seen it. I suppose it was the largest hay-rick that ever was built, or that probably ever will be. It contained the entire quantity of hay that grew in three years on a very fine farm of not less than a thousand acres extent. It belonged to a nobleman, who had reared this probably to satisfy a curiosity somewhat of the nature of that which attracted my notice; and I am persuaded that it cost him in all above a thousand pounds to satisfy that curiosity. After allowing it to stand two years, it was sold and carried off. Any person who shall take the trouble of casting up the number of loads of hay that it contained, will be astonished at its amount; which I recommend to my readers as an amusement for a few idle minutes. I shall barely hint, that at the present time it would, doubtless, have brought in London above thirteen thousand pounds.

I conclude then, that the *magnitude* of this object was the circumstance that chiefly affected my mind with that powerful impression of grandeur; for I have seen many hay-ricks which resembled this in neatness and proportions, but which excited not the smallest idea of grandeur of any sort. Generally, then, I

would infer, that magnitude of size is an essential requisite in a structure that is intended to convey an idea of grandeur and dignity.

But that magnitude alone will not be sufficient to produce this effect I am convinced, from many observations; for I have certainly seen several structures which *in size* were equal to the above, but which did not excite in my mind a sensation that could in any degree be compared with the former. Among these objects I would beg leave to mention St. Paul's church in London, because it is so generally known. When I first beheld this immense pile, which I conceive to be equal at least in size to the hay-stack, and which in point of novelty to me must have been much greater, the effect it produced upon my mind, I can well recollect, fell infinitely short of it. In searching about to try to discover the cause of this diminution of power, I can fix upon no circumstance that seems to me so probable, as the diversity in its proportions, and the complication of its parts. The one was a great, simple, undivided whole, which filled the mind without distracting the attention; the other does not produce that repose of effect. There is, if I may so speak, a kind of perturbed sensation. The mind wishes for leisure to grasp the full idea of its magnitude; but it is continually called off to examine some of its parts. This complex perturbed sensation may, I think, be called *wonder*, which is very different from that calm, dignified expansion of mind that I would call grandeur. Magnitude and simplicity then must, I think, be combined together, where it is intended that an object should assume the character of grandeur. The

Pantheon at Rome accords with this description, and it has been very universally recognised as more effectually suggesting the idea of grandeur than any other building at Rome.

Nor do I apprehend, that even these two circumstances are all that are necessary to produce this effect; for I have doubtless seen some objects, in which both magnitude and simplicity are combined, without exciting an idea of grandeur. I do not recollect any object at present in this neighbourhood to which I could refer the reader for an illustration here; but I think it may be in some measure done thus. There is a high, plain, unornamented brick wall that surrounds the King's Bench prison in Southwark, which, in its present state, conveys to my mind an idea of something approaching to grandeur. The wall is new and neat, and all the joints, when viewed near at hand, appear plainly conspicuous. But it is easy for any one to conceive, that were this wall covered over with a coating of plaster which was worn down in part, and partially discoloured, instead of conveying an idea of grandeur, it would appear to be a shabby, mean, disgusting object. Here the same magnitude and simplicity of form remains, but the effect is lost. Before an object, then, can excite the sensation of grandeur, I conceive, it must not only be large in size, and simple in form, but the parts must also be symmetrically arranged and compactly put together; otherwise the effect will be lost.

To these I would add, that the parts which come near the eye must be striking and bold; and that the object must be one, and clearly definite; for where it

runs along in one direction till its size dwindles into insignificance, it tends to distract rather than to fill the mind. Where the structure is so large then as not to admit of being all seen to advantage as one whole, it ought to be so divided, as that each part, when viewed near, may be considered as a whole; and then the other parts may serve to heighten its effect by way of contrast.

Hitherto I have only directed the attention to entire structures. But when we consider the striking effect that ruins are universally admitted to excite as objects of grandeur, this may, perhaps, seem to counteract the foregoing reasoning in some degree; and therefore these objects require to be examined.

It is admitted, then, as a fact very universally recognised, that ruins of large structures are well calculated to excite an idea of grandeur; I believe it will not be denied, that they operate even more powerfully in this respect than the buildings themselves in general when they were entire. Let us not then lose sight of these precious facts, whatever shall become of our foregoing reasoning.

But do all ruins produce this effect? No. There are many which excite only the ideas of disgustful desolation. It is those only which are of great magnitude, whose projections are bold, whose elevation is lofty, and that discover undeniable vestiges of symmetrical arrangement, which are calculated to impress the mind with an idea of grandeur. They have lost, indeed, that simplicity of form which I have conceived to be an indispensable feature of grandeur in a perfect building; but, unless the parts of these ruins be very

large and few, so as to allow the imagination to combine them into a simple whole that can be easily grasped by the mind, they can never, when nearly viewed (in as far at least as my sensations have indicated) produce a vivid impression of grandeur. When viewed from a distance, I conceive that nothing but magnitude simply can produce the sensation of grandeur; and in that way even the upper part of Drury Lane Theatre constitutes an object of grandeur when seen from Surrey and the adjacent parts, though it is totally destitute of every other requisite that could attract notice. When ruins that are seen from a distance exhibit fantastic forms, and bold elevations, they produce a striking effect, which has been demoninated *picturesque*, but which has a much more intimate connexion with the sensation of beauty than of grandeur.

If, in all disquisitions concerning objects of taste, strong and vivid sensations were thus to form the basis, like facts in physics, and our reasoning faculty were only resorted to for the purpose of extending our views to others of a similar kind, and thus connecting, arranging, and combining them in various ways, and then deducing general conclusions, much good might result from it; and such disquisitions might afford both pleasure and instruction: but when persons who have none of those native, unsought for, warm and feeling perceptions of mind, departing from the province which nature assigned to them in this world, shall sit down to analyse what they never perceived, and by a series of dry hypothetical arguments shall pretend to overrule the strong propensities of nature, by telling why we should be pleased with this thing, or dislike that,

and prescribing dictatorially what we should admire, and where we should be disgusted, we may thus go on in a kind of labyrinth through an endless succession of ages, in a series of perpetual wranglings, without ever being able to come to any satisfactory conclusion.

[*To be continued.*]

Farther observations on Coutchouc,

[*Continued from page 78.*]

ALLOW me to add a few other observations on the uses that may be made of Coutchouc, before we proceed to particularise the tree from which it is produced, and the mode of obtaining the juice in abundance.

To the lovers of the fine arts this substance promises to be a most valuable discovery, as it bids fair to confer upon their works that immortal youth which Hebe "ever fair and ever young" possessed among the gods. To speak seriously, if any thing can preserve the works of the pencil from the destructive ravages of time, it would seem that this is the very substance that is fitted to do it. In the first place, the canvas on which paintings are made can be thus entirely protected from the operation of moisture or the corrosive vapours of the atmosphere in a manner that could not be effected by any other substance hitherto discovered by man; so that we may naturally infer, that it would be preserved fresh and firm for an indefinite length of time. In the second place, the painting, when properly finished and thoroughly dry, if then covered with a coating of this varnish in its fluid state, would quickly dry, and from that moment would not only be defended from dust and every other impurity that could

tend to sully it, but would also be protected entirely from the influence of the air, which, by an operation certain, though slow, inevitably impairs the lustre of the finest colours. And though it be true, that the Coutchouc is not itself entirely colourless, yet the coating that would be necessary for this purpose would form only a film of the thinnest sort, that would, like glass before a print, serve but to soften the glare, and make the tints melt into each other with the most enchanting sweetness. It possesses even other peculiarities in this respect which ought not to be overlooked.

It appears by the experiments of Mr. Howison, that though Coutchouc admits of being spread upon the surface of wax so as to form a thin uniform undivided film, yet it does not adhere to that substance; so that it can be drawn from it without deranging its surface, even as a stocking can be drawn off from the leg without any disruptive violence. From this circumstance, I conceive that coutchouc varnish, when applied to the surface of an oil painting, would differ from all other kinds of varnish in this respect, that it would form only a separate coating before it, as a glass before a print, instead of adhering to it inseparably like other varnishes: of course, should it happen in the course of time, that this coating became sullied or tarnished in any way, it could be taken entirely off without affecting the painting in the smallest degree, and a fresh one put in its place exactly as a new glass could be put before a print.

But, says some one, if this varnish does not adhere to the painting, how can you prevent it from falling

off, or how can you prevent the air from getting access behind by insinuating itself at the edges all round, and thus effectually injuring the picture? I answer, by a contrivance the most easy and simple that can be conceived. As the canvas on which the painting is made has been coated with coutchouc, it follows, that if a part of the edges of that canvas which is nailed to the stretching frame shall be left untouched by the oil paint, the coutchouc varnish, wherever it reaches that part of the canvas, will there adhere to it indivisibly as one substance, without the smallest pore or opening of any sort; thus is the painting enclosed between two coats of coutchouc without the smallest opening of any sort, exactly as if it were put within the cavity of a glass hermetically sealed. And, although the film of varnish that is before the picture be extremely fine, yet, under these circumstances, there is no danger that it will ever separate from it, unless a hole be somewhere made in it: for, as it is applied at the first quite close to the picture, so that no air can be lodged behind it, the pressure of the atmosphere acting continually upon it from without, as upon the surface of an exhausted receiver, will make it apply as close to the surface of the painting as if it actually adhered to it.

But, says the same captious gentleman, you forget, sir, that as your coutchouc does not adhere to oil paint, so neither will your oil paint, it is to be presumed, adhere to coutchouc; therefore your fine system of painting on coutchouc-canvas, and all the superstructure you have raised upon it, falls to the ground like a house of cards, that is scarcely reared up when

it is utterly destroyed. I answer, no, sir, I had neither forgotten the one, nor overlooked the consequences of the other; but I had reserved the answer to illustrate some other beneficial uses which, in this line, may be made of the singular substance that now claims our attention.

It does not, in the first place, follow, though fluid coutchouc should not adhere to solid paint, that fluid paint would not adhere to solid coutchouc; that is an experiment which remains to be tried, as the fact has not, that I know of, been hitherto ascertained. But, supposing it were found that oil paint could not be made to adhere to coutchouc canvas, it would produce very little effect upon the case in question. All that would be required in this case would be, to have a canvas *properly prepared for painting on*, laid upon a coutchouc canvas before it was nailed upon the stretching frame, so that they could be both laid on together, taking care to press the two so close together, by passing them between two rollers or otherwise, as to extrude all the air from between them, after which they should be nailed upon the frame. But in this case the inner canvas ought to be made of such a size as not to reach so far as the outer edge of the stretching frame; and a few holes should be made all round the edges of the inner canvas, but so as that these may all be covered by the picture frame when the whole is finished; this smaller canvas being secured in the meanwhile by a few half-driven tacks that may be afterwards drawn. In this state the picture may be painted; and when it is finished and dry, the coutchouc varnish may be applied. Under these circum-

stances, it is obvious, that the front varnish must adhere to that at the back all round the edges where they meet; and that the holes left in the edges of the painted canvas will serve to unite that to the coutchouc canvas at the back, as if it were by so many incorruptible tacks that cannot be removed. Thus is our painted canvas effectually enclosed in a transparent case, hermetically closed all round, without the possibility of having any air admitted to it either from behind or before, unless by tearing it with violence.

I have been at the pains to describe this process so minutely, chiefly with a view to show, that by a similar mode of procedure paintings in crayons, and those in water colours, whether opaque or transparent, each of which possesses certain excellencies peculiar to itself, may by a similar procedure be rendered at a small expence equally indestructible as those in oil, a desideratum that has been long and ardently looked for. We have met with no facts as yet that give us reason to suppose that coutchouc, when in its natural fluid state, acts chemically as a menstruum on colours that enter into the composition of any kind of paint. Neither do I know that it would adhere to paper, or the substance of water colours; but I am rather inclined to think it would not, and that it could be formed into a thin inadhesive film before them as a glass; and that, of course, they might all be closed hermetically between two layers of it, without much trouble or expence, as above described.

After the same manner might be preserved for any length of time, without any abatement of their sharpness, drawings in black chalk, the singular spirit of

which drawings is well known; but, on account of the difficulty of preserving them, that manner of drawing has been reluctantly abandoned by every artist; so that its full powers may be said to be as yet, in a great measure, unknown. A path is thus opened to the exertions of genius that may be said to be untrod-den by any one; and who will pretend to set bounds to the sublime effects which may thus be rapidly produced?

It is scarcely necessary, after the above, farther to specify, that large prints, which do not admit of being glazed but at an enormous expence, may be thus most effectually secured even at a moderate charge.

I have been at the pains to give this glance at a few of the valuable uses that may be made of this singular production, with a view to impress the mind of the public, as early as possible, with a deep conviction of the importance of extending the cultivation of the plant that produces it, as soon as may be, in places that are well adapted for its growth. All these uses, however, it ought never to be forgotten, depend upon our being able to obtain the juice in its native state; for, after it has been once concreted, it never can be made to answer these purposes by any process that has been yet discovered. And, though Mr. Howison has found that the juice retains some of its native qualities for more than a year without any preparation, yet he fails not at the same time to remark that they were greatly weakened. Our distance from India is such as to bar us from the hope of ever being able to obtain the native juice from thence in a proper condition for use in such quantities as might be wanted. But should a

time ever come, when a friendly intercourse shall be established between us and the natives in the northern parts of Africa, where this plant, in all probability, might be reared in abundance, as well as many others that would prove highly beneficial to us, we might then hope to be able to profit greatly by this valuable discovery. With a view to forward this improvement, I shall soon give a botanical account of the tree as communicated by Dr. Roxburgh, with hints tending to facilitate its propagation, adding some useful experiments made by that gentleman upon the concrete juice, which will open the prospect of improvements of a kind different from the above, that our posterity may derive from this singular production of nature.

On Plagiarism and Plagiarists.

No one thing in the literary world excites such universal detestation as plagiarism; and, indeed, there is such a meanness in the idea of one man endeavouring to avail himself of the talents of another for augmenting his wealth or his fame, that it is, perhaps, impossible to express with sufficient energy the despicable contemptibleness of a being who is capable of deliberately engaging in such an attempt.

But in proportion to the degradation which such a character implies, ought our caution to be to avoid involving the innocent in the heavy opprobrium of such an imputation. We ought in no case, therefore, ever to admit the charge, until all the circumstances have been deliberately weighed, and fully proved upon the most undeniable evidence. But are literary men al-

ways thus cautious before they admit a charge of this kind as fully established? I fear not. I suspect that there may be on many occasions even such apparent evidences of plagiarism as may seem to authorise a kind of suspicion of it, where there is in truth not the smallest foundation for the charge; nay, I can adduce the most satisfactory proofs that this has actually been the case. I shall hope, therefore, to meet with the indulgence of the reader while I bring forward a few considerations which ought to induce caution, and arguments for admitting nothing but the most incontestible evidence where imputations of this kind are made. It is the cause of innocence that I defend; for, if this shield be removed, innocence can have no protection.

No person who has ever seriously reflected on any subject can avoid perceiving, that on many occasions an author whose works he is perusing expresses, perhaps with the most accurate precision, the same ideas that occurred to himself; and I appeal to the recollection of every person of the above description for a proof of this fact. In the case above supposed, no suspicion of plagiarism could lie against the author, because his work was composed, perhaps, many years before the reader was born. But had the person to whom this idea occurred been writing a book at the time, and had he expressed that idea entirely from his own conceptions, as he did every other that occurred to him, in the language that seemed to him the most natural, Would *he* in this case have been more guilty of plagiarism than the other? Assuredly not. Yet how often do we see persons busily employed in raking

up from the oblivion in which they had long been buried obscure authors, and pointing out with great parade passages of more modern writers, in which analogous ideas occur, as palpable and undeniable proofs of plagiarism. Nothing can be more trifling than such a procedure; and it would only deserve the sneer of scorn, were it not for the malevolence of the intention, and the mischievousness of the deed, which requires a more serious reprehension. If truth be only one, assuredly it can neither be deemed impossible nor improbable, that when two persons are separately contemplating the same object, let the distance between them in point of time or place be what it may, it should appear to them both under the same point of view. An instance of this kind once occurred to myself; and, as it does not admit of a misrepresentation, I may adduce it as a fair illustration of this point.

In the year 1782, the ingenious and reverend Josiah Tucker, Dean of Gloucester, so well known for his many valuable moral and political writings, published a pamphlet which he called *Cui bono*, alluding to the then state of our American colonies, in which he endeavoured to inculcate some principles which have been since very generally recognised as just, but which were far from being thought so at that period. About the same time (nor do I at this moment know which of the two appeared first) was published a pamphlet by me upon the same subject, in which precisely the same conclusions were deduced as in *Cui bono*. The Dean was so forcibly struck with this circumstance, that having obtained my address he wrote to me a very polite letter on the occasion, which began a friendly

correspondence that was only terminated by that indisposition which put an end to all his writing; but not content with this, he thought it proper to take notice of this surprising coincidence in the preface to the third edition of his *Cui bono*, and to refute, in as far as depended upon him, every idea of plagiarism. For my own part, as I knew no more of Dean Tucker's intention of writing on that subject while I was writing mine, than I did of the transactions in the moon; and as my pamphlet had not begun to be written above a week before it was sent off to the press, I was equally satisfied that he could know nothing of it; so that I never once employed a thought upon the subject. I was not, however, the less sensible of the obligations that I owed to the benevolent Dean for the trouble he had taken about it, when he sent me a present of that preface along with a copy of all his other political works that were on sale; for there could remain no doubt that it was on *my* account it had been written; as no person would suspect that a man of his established reputation and abilities could have borrowed from me, whatever might have been their conjectures respecting so obscure a writer as myself in such a case.

A coincidence of ideas may so naturally occur to different persons when they contemplate the same subject, that I confess I am rather surprised, that mankind should in general be so much inclined to suspect plagiarism where such coincidence is casually observed; for it appears to me to be so unavoidable, that I think it is altogether impossible it should not often occur without the smallest communication be-

tween the parties. I have certainly often felt it myself; and in the days of my youth, when a sort of ambition for distinction will steal across the mind of most persons at times, I have no doubt felt some times a sort of disappointment at observing, that what I had cherished for many years perhaps as an original thought of my own of some degree of brilliancy, or perhaps a discovery, had been clearly expressed by another, who wrote possibly long before I was born. Such coincidences of particular thoughts I have doubtless often met with in the course of reading both of ancient and of modern authors; and the same thing must certainly occur in the same way to other persons, a recent instance of which that very lately happened, I shall here relate.

The person who wrote some thoughts on mouldiness, published Vol. I. page 126 of this miscellany, and who adopted the signature of *A Young Inquirer*, lately came to me in a sort of perturbation that was very perceptible. When I asked what was the matter; "Why," said he, "you recollect the few thoughts I sent to you on mouldiness." "I do; and what of them?" "I protest," said he, "that I had no more idea at that time that any other person had conceived the same notions, than the child that is unborn." He then read a short passage from the works of Mr. Bonnet of Geneva (which book I knew he had only got possession of for the first time about a week ago), that contained precisely the same idea respecting mineral crystallizations, assuming on some occasions the appearance of mouldiness, which was expressed in words not very different from those that my correspondent

had used. "And will not every person think," said he, "that I have been a mere plagiarist; yet I protest that I never read one word of Bonnet's works until the day that you saw me get that book." I smiled at the earnest anxiety of my young friend, and told him that he needed to give himself no uneasiness on that head; for, if he should live a little longer, he would have occasion to experience many things of the same sort; and that no person of sense would draw a conclusion of the sort he feared from such a casual coincidence as he had stated.

But it sometimes happens, that the resemblance between two passages is much more striking than any of these; as it may extend even to the very words as well as thoughts, where no communication took place, of which I shall here adduce a striking instance that came within my own knowledge. Many years ago, when I was a young man, living by myself in a solitary hamlet, at a distance from friends, and not superabounding with books, I was under the necessity, for the sake of amusement, of engaging in such mental disquisitions as chance should suggest. As I had at one time found it difficult to give a young lady, who understood no language but her own, a clear notion of the difference that is often observable between a poem of merit in one language and a translation of it into another; and particularly of the great amplification which in such cases sometimes takes place, where the translator is anxious that no particular should be dropped; I tried, with this view, to *do* the following beautiful passage of Thomson into such rhyme:

The original.

Is not each great, each amiable muse
 Of classic ages, in thy Milton met?
 A genius universal as his theme,
 Astonishing as chaos, as the bloom
 Of blowing Eden fair, as heav'n sublime.

The same done into rhyme, in imitation of a paraphrastic translation.

In thy great Milton is there not combin'd,
 With manly sense, an elegance refin'd?
 Flowing as Maro, and as Ovid sweet,
 As Pindar lofty, and as Homer great;
 Sublime as heav'n he rapid wings his way,
 And shines refulgent like the God of day:
 Or smoothly sweet his gliding numbers flow,
 Calm the rough mind, and teach the heart to glow
 With ecstasy divine, and holy love,
 Like that the angels taste in realms above.
 Not Eden's happy plains, in all their prime
 Of blooming youth, uncramp'd by hoary time,
 Could more calm pleasure to the soul convey,
 Than his soft, tender, sympathetic lay.
Or if on ven'rous wing he soars sublime,
And leaps majestic o'er the mounds of time,
 Th' astonish'd mind his wondrous flight pursues,
 And trembling follows his advent'rous muse
 Through Chaos' dreary, desolate domains,
 The realms of night where horror ever reigns,
 And Death, and Hell, that dismal dread abode,
 Of impious angels fallen accurst of God.

These lines were written more than thirty years before I had an opportunity of seeing the following verses, which were transmitted to me by the earl of Buchan for insertion in the Bee as an unpublished poem (all excepting the last eight lines, which stand in all the editions of Mr. Thomson's works). I give the piece

entire on account of its merit. But the purpose for which I here adduce it is, to point out the surprising coincidence, even in words, as well as sense, between the two lines above that are printed in italics, and those below marked in the same way; though assuredly, at the time the first were written, the author had no more idea that the last had ever existed, than he has of what is passing in China at the present moment.

*Poem on the death of Mr. Aikman the painter,
by Mr. Thomson.*

O! could I draw, my friend, thy genuine mind,
Just, as the living forms by thee design'd!
Of Raphael's figures none should fairer shine,
Nor Titian's colours longer last than mine.
A mind in wisdom old, in lenience young,
From fervent truth where every virtue sprung;
Where all was real, modest, plain, sincere,
Worth above show, and goodness unsevere.
View'd round and round, as lucid diamonds show,
Still as you turn them, a revolving glow:
So did his mind reflect with secret ray,
In various virtues, Heav'n's eternal day.
*Whether in high discourse it soar'd sublime,
And sprung impatient o'er the bounds of time;*
Or wand'ring nature o'er with raptur'd eye,
Ador'd the hand that turn'd yon azure sky:
Whether to social life he turn'd his thought,
And the right poise that mingling passions sought
Gay converse blest, or in the thoughtful grove,
Bid the heart open every source of love.
In varying lights still set before our eyes,
The just, the good, the social, or the wise.
For such a death who can, who would, refuse
The friend a tear, a verse the mournful muse?
Yet pay we must acknowledgment to Heav'n,
Though snatch'd so soon, that AIKMAN e'er was giv'n.

Grateful from nature's banquet let us rise,
 Nor meanly leave it with reluctant eyes:
 A friend, when dead, is but remov'd from sight,
 Lost in the lustre of eternal light;
 And when the parting storms of life are o'er,
 May yet rejoin us on a happier shore.

"As those we love decay, we die in part;
 "String after string is sever'd from the heart,
 "Till loosen'd life at last—but breathing clay,
 "Without one pang is glad to fall away.
 "Unhappy he who latest feels the blow;
 "Whose eyes have wept o'er ev'ry friend laid low!
 "Dragg'd ling'ring on from partial death to death,
 "And, dying, all he can resign is breath."

If, then, two passages so nearly and strikingly alike in words as well as sentiment, as the passages above marked, were written without the smallest knowledge of each other (which I most solemnly aver to have been the case), ought not this to render us extremely cautious how we admit a charge of plagiarism against any one, merely because of a similar coincidence of thought and expression? Certainly other strongly corroborative circumstances ought to accompany such a charge, before we admit of it as valid.

A coincidence of the same nature may be produced in another way, which cannot, in justice, be imputed to any one as culpable plagiarism, even where the one is really and truly derived from the other without any acknowledgment. A person who is in the habit of reading derives information from a vast variety of sources: from the information thus obtained, and from the observations he himself has made, and the reflections these have suggested, all blended together, and thus accumulating for many years, the whole of the

knowledge he possesses at any one time is derived. When he has occasion to call forth that knowledge on any particular subject, it may not be possible for him to discriminate precisely what he has derived from his own observation from what he has obtained from other sources. When he even writes down what he conceives to be the emanations of his own mind, the sentences may fall into a certain arrangement that pleases him, without his being in the smallest degree conscious that this arrangement so pleasing to him was perhaps suggested by something that he had long ago read; he may thus chance to mistake for the real and uninfluenced dictates of his own understanding, what he has in reality derived from another source. It would be hard to accuse of the crime of plagiarism a man who was thus inadvertently betrayed into it. Nay, he may in this way, on some occasions, mistake that which was actually written by himself for an extraneous performance; or, he may recollect a passage with great distinctness, without being able to say whether it originally belonged to himself or to another person. I can at present adduce an instance of this last kind that occurred not long ago to myself. Having occasion (Vol. I. page 81 of this miscellany) to make some observations on the utility of periodical performances, a line occurred to me, strongly expressive of an idea that has long (it was not the first time I had used it) prevailed in my mind upon that subject, which I put down as a motto to that paper. It is,

Teaching we learn, and giving we receive.

Now where I met with that line, or whether I ever

met with it any where, I know no more than you do. It may have been an original thought, which assumed the form it now bears in my own mind, or it may possibly have been suggested by another. I therefore marked it down as anonymous: but if I had not done so, I do not conceive, from the present impression on my mind, that I could have been accounted guilty of culpable plagiarism, should it even be afterwards discovered to have been originally employed by some other person.

Since I am in the mood of transcribing, I shall quote another passage from a beautiful little poem, in which a similar coincidence occurs, that some surly critics would perhaps deem a sort of plagiarism, but which I have the authority of the writer to say was entirely unobserved by him at the time the poem was printed. He drew the picture from what he recollected to have often seen in nature, and viewed as a very striking feature in that scene which strongly at the time engaged his attention; nor did he in any manner recognise what he now conceives may perhaps have had some share in adding to that pleasure which the expression marked in italics gave him, till a friend pointed out to him the following line in Thomson:

The conscious heifer snuffs the coming storm.

and, as he had undeniably read this poem before, he thinks it not impossible that that line, lurking in his mind unobserved, may have given rise to the thought, which is, in a slight degree, correspondent to one in his own poem, though he is still inclined to believe it was only the spontaneous result of his own observa-

tions. The little poem from which these lines are extracted is entitled, "An Address to Loch Lomond." The author is Mr. James Crie of Edinburgh, from whose pen the public, if I am rightly informed, may soon expect a larger work in the same style, being a tour through a considerable part of Scotland. The reader should be told, that Ben Lomond is a very high hill, whose base encroaches on the lake which is the subject of the poem. The description will be best relished by those who are familiar with mountain scenery.

High on the east thy great Ben Lomond rears
His lofty head, and hides it in the clouds.
These, oft attracted by his tow'ring height,
Stop short their airy flight, and form a veil,
Which dark and thick descends. Condensing still,
Part slowly sails along, and, swelling, shrouds
The neighb'ring hills: the glens how dark between!
The winds are hush'd: the birds expectant pause:
The ox, with wistful gaze, eyes the deep gloom.

Nor voice of man is heard, nor pipe, nor horn;
But silent-expectation reigns, and boding fear.

Sudden, athwart the gloom the lightning's glance,
As quick reflected by the placid lake,
With lurid glare darts bright. Anon, sublime,
In awful majesty the thunder rolls;
Onward it rolls, and loud and louder roars
In bursting peals successive, heard afar,
Re-echo'd oft by rocks and caverns deep
From all the neighb'ring hills, till circling round,
Still gaining force, again it bursts, a peal
That stuns the ear. Rocks dash'd on rocks are heard
Rattling around. The stoutest heart, appall'd
With wild dismay, scarce dares to eye the gloom
Deep seam'd with frequent streaks of moving fire,
Darting in rapid gleams from cloud to cloud.

The clouds are seen in wildest tumult mixt;
 And now—a mighty flash, with fearful glare,
 Wide opens half the sky. The heavy rain,
 Pouring in streams, resistless rushes down,
 Plows the red mould, and bears it to the main.
 Nature convuls'd, the everlasting hills
 Appear to totter, and the total wreck
 Of all terrestrial objects seems at hand.

Not long this uproar lasts. The clouds dispel:
 The sun looks joyous forth: the pleasing vale,
 Now deck'd with renovated verdure, smiles:
 The setting sun, with parting ray uprear'd,
 Ben-Lomond, last of all our mountains, gilds.
 Day, as averse to leave the pleasing scene,
 Slowly retires far north,—nor quite forsakes—
 But soon returns more bright and fair, to glad
 With morning beams his lofty pathless top;
 Whence the advent'rous youth, with eagle eye,
 Fir'd with the love of knowledge and of fame,
 A prospect wide of vast extent descries,
 Of hills and dales, of friths and winding shores—
 Beneath, the lake itself in part conceal'd;
 The Clyde, with crowded sails and streamers gay;
 [The slow dragg'd bark that seems to plough the land
 Across that narrow isthmus, often stain'd
 With floods of British and of Roman blood.*]
 Eastward, the mazy Forth, meand'ring slow,
 For largest fleets a deep and safe retreat,
 Rich with the treasures of remotest climes;
 Edina's lofty towers; the eastern coast,
 Far as the Cheviot fells; the western isles
 Of Bute and Arran; Ailsa's conic rock;
 Old Rothesay's *royal towers* in ruin laid;
 Hibernia's verdant hills and fertile plains;
 The rival height of great Plinlimmon too

* The Carron canal, which joins the Clyde and the Forth, runs along nearly the same line that was occupied by the wall that was reared by Severus, vulgarly called Græm's Dyke, to check the inroads of the Caledonians upon the Roman province.

In distant Wales: though Skidda, Cambria's boast,
Beyond the Solway frith, unnotic'd stands;
While hills on hills still higher rise behind.

The three lines within crotchets are an interpolation by another hand, who thought the subject in some measure demanded them.

Reflections on the Lazzaroni of Naples, a singular order of men in civil society, from Gorani's Travels.

WE have before spoken of the vices, ignorance, and superstition, in which this people are plunged; but we also remarked, that they have much energy, and that, with another constitution, the Neapolitans would become one of the most estimable nations. The great do not impose upon the lower classes in this country; and the meanest of the king's subjects speaks to the ministers, to the queen, and to the monarch, with the utmost freedom. The government, in short, though full of abuses, does not treat the people with the same contempt as is done in other kingdoms.

The history of Naples shews us, that the inhabitants of that town have at times made dangerous insurrections. Mafسانیello will be long remembered, who governed for some days as an absolute master, and made himself respected as the representative of a people who felt its own dignity. If the court had not used much address in gaining over the monks and preachers, who have great influence over the Neapolitans, this country would have undergone revolutions

that would have totally changed the mode of government.

The people of Naples are the only persons in Italy who have opposed themselves with constancy and effectually to the establishment of the inquisition. They have always had the art to rally themselves under chiefs, if not in a whole body, at least with the most vigorous of its inhabitants, called the Lazzaroni. This name comes from Lazarus, who is represented as a beggar covered with rags. If the Lazzaroni are not all in this condition, their dress is not very brilliant. These men have always a leader, to whom the court and the ministers pay great respect. It is this chief who has charge to make the people respected, and prevent any wrongs from being done to them. What is the most astonishing, is, that there never has been an example of any one of these chiefs suffering himself to be corrupted.

These Lazzaroni have particular laws for themselves; they assemble together whenever there is a necessity for it, and the government cannot prevent them from so doing. They are so numerous a body, that it would be ill judged in any one who should attempt to reduce them to a servile obedience. They even assist the police in quelling partial tumults, which sometimes happen, and not through any fault of the government.

The Lazzaroni are much attached to their condition, and bear no envy toward the upper classes. They commit no disorder, nor thieve, nor rob. They are never implicated in the crimes which are committed at Naples. In truth, they are an estimable, good, and

honest people, and contented with their poverty, which must not, however, be confounded with wretchedness. After this remark, the Lazzaroni must not be ranked in the lowest class of the people, which is the scum of the nation, full of scoundrels, and a crowd of pick-pockets who are more industrious at Naples than at London or Paris.

We have said, that they have a chief. This chief has assessors. He is a real tribune of the people, but without the magisterial robe, and without guards, though he makes himself be attended by as many of his brethren as he may choose. He has the right to offer remonstrances to the king and to the ministers; and there are ceremonies at the court, where this chief has his place. When the queen is brought to bed, the Lazzaroni send their chief, well attended, to be assured that the child is of the wished-for sex. The child is put into the hands of this chief, who kisses it, and shews it to the people, whom he harangues in his jargon with real eloquence. It is to be remarked, that these Lazzaroni in general speak very well, with order, and sometimes with dignity, but always in their own jargon.

The Capo Lazzaro, or chief of the Lazzaroni, assists at the drawing of the lottery; at some ceremonies of the church; and at all the grand ones of the court, without wearing any marks of distinction on his dress; but is always respected, because he has under his command from forty to forty-five thousand men, to whom may be added the watermen, the fishermen of the Chiaia, and all the lower classes of the people.

The Lazzaroni, however, are not always in their rags. On feast days, they are gaily dressed, but always according to their costume, with handkerchiefs of silk, and silver buckles to their shoes and knees. In tumults, their chief becomes a personage of importance, round whom every one rallies. The court has then no other resource than to pay some preacher beloved by the Lazzaroni, and in odour of sanctity among them; and these preachers always succeed in calming the fury of the populace.

Extracts from the correspondence with Dr. Anderson, Madras.

[Continued from Vol. II. page 308.]

To James Anderson, Esq. P. G.

DEAR SIR,

Bombay, September 8, 1798.

To enable me to give you, agreeably to my promise, a detailed account of the accident which happened to me at Pondicherry, I have been making every search, ever since my arrival here, for the paper on which I had written the particular circumstances attending it, hitherto to no purpose, I fear, therefore, that it is irrecoverably lost: and I hope you will be satisfied with the following relation from my memory.

On the evening of the 7th of August 1797, about seven o'clock, after leaving the house of a sick officer, a little to the northward of the main guard at Pondicherry, in stooping to buckle my shoe, before I got to the garden gate, I was bitten in the left wrist by a

snake. The pain was instantaneous, and much more excruciating than what I had felt from the sting of a scorpion some years ago in the West Indies. I immediately returned to the sick officers house, and was not a little surprised, when I neither saw blood on my wrist, nor apparently a wound: but, as I had frequently seen the hooded snake in the garden (where they resorted in numbers towards the evening in search of food, from under a great pile of wood lying for sale on the outside), and continued in great agony, I began to be very much alarmed, stepped into my palanqueen, and went homewards. Before I had proceeded half way to my own house, although the distance did not exceed a five minutes run for my boys, I became excessively sick at my stomach, and continued retching violently all the way home. As soon as I got home I rubbed my wrist smartly with spirits of hartshorn; and no sooner was it applied than I could both feel and see that I had received two small wounds at the distance of half or three quarters of an inch from one another; the vomiting had now ceased, and I, anxious to have recourse to the internal use of spirits of hartshorn as the only medicine on which I relied for my preservation, dashed some into a glass of water, and drank it; this staid on my stomach. In about a quarter of an hour I took a second draught; and in about the same space of time a third: this remained but a short time on my stomach, when a severe retching came on, which brought up much bile; this vomiting I attribute, in some degree, to having put too much spirits of hartshorn in the water I had drank: and after this I measured the quantity I mixed, a pre-

caution which my eagerness to use the hartshorn made me neglect at first. From this time I had no more vomiting, although I took several tumblers of weak hartshorn and water, but sweated so profusely, as to oblige me to change my linen thirty times in the course of the night. I continued rubbing my wrist with the hartshorn until I made it quite raw: and kept at it compresses wetted with the same spirits so long as I continued awake. From my being very much inclined to sleep after I began to perspire, and the pain in the wrist abating considerably about midnight, I think that I would have slept well, were I not obliged to shift so often; but from this circumstance I had no sound rest. Next morning I felt very languid and fatigued, like a man after performing a long journey, without the least power in the arm wounded; the lassitude and general soreness wore off in a few days, and the wounds healed up in less than a fortnight, without any thing extraordinary in their appearance, but my arm still continues extremely weak, although I have the perfect use of every joint. From this circumstance, and my turning sick at stomach so soon after the bite, I conclude that the snake must have been poisonous, but from the size of the wounds, young; and therefore, perhaps, not sufficiently powerful to occasion more violent symptoms. This, however, is mere conjecture, and probably, if I had not used the hartshorn so liberally, I might have found the poison perfectly powerful.

C. ANDERSON.

*To C. Anderson, Esq. Surgeon of his Majesty's
72d Regiment.*

DEAR SIR,

Fort St. George, Oct. 1, 1798.

I AM favoured with your letter of the 8th ultimo, and have no regret that the papers you mentioned are mislaid, as I conceive a deliberate recollection at some distance of time is better than circumstances that could be committed to paper, while the mind was in a state of uncertainty from so dreadful an accident as the bite of a snake. Your own professional abilities renders an account given by one who is both physician and patient so highly interesting to the *Materia Medica*, that I deem it a duty incumbent on me to make your case as public as possible, for the relief of those who may chance to meet with a similar accident.

JAMES ANDERSON.

To James Anderson, Esq. P. G.

DEAR SIR,

Arcot, November 13, 1799.

I HAVE the pleasure to send you the history of a case, which was attended with the most alarming symptoms, as a confirmation of the beneficial effects to be expected from the eau de luce, or spirits of hartshorn, in the bites of even the most dangerous snakes. On the 11th of this month, at half past three o'clock, P. M. one of the dooley bearers of the 2d regiment of cavalry in the act of cutting a branch of a tree, about one hundred yards from my house, was bit by a snake on the outside of the left leg a little below the knee. He felt immediately the

pain stretching up his thigh, and in the course of ten or twelve minutes he was seized with violent spasms all over his body, and fell down apparently without sense or motion. He was then brought to me, when I found all his joints quite stiff, his limbs rigidly extended, pulse hardly to be felt, and jaws fast locked. Having no eau de luce at hand, I put a tea spoon full of hartshorn into a tumbler with a small quantity of water, and having with difficulty opened his mouth by means of a turnscrew I poured it in, but the power of deglutition being perfectly gone, only a very small part found its way to the stomach. In ten minutes more I repeated the draught, and again a very small quantity got to the stomach; ten minutes after I gave him another dose, when, by holding his head back, the greatest part went down, and in a few minutes he was sensibly relieved, as his joints became more pliable. I now received some eau de luce, and in about ten minutes gave him about twenty-five drops mixed with a little water, which, by holding his head as before, got all into his stomach. He now began to recover his recollection, and upon being asked, pointed that he felt a pain in his breast and the crown of his head. Half an hour after giving the last dose I repeated it, and in about five minutes he was seized with vomiting, when he brought up a small quantity of green slimy matter, which seemed to relieve him greatly, for he was then able to look about him. I repeated the medicine every half hour, and after every dose he got a little better, so that at nine o'clock he was able, with a little support, to walk home from my house, scarcely feeling any effect, but perfectly well.

During the internal exhibition of the medicine the wound was rubbed with it, and seemingly with some good effect. The snake was not killed, so that I cannot say what species it was of, but from the violent effects produced by its bite, I have no doubt of its being a very dangerous one.

WILLIAM MACKINTOSH.

To Dr. Anderson, &c.

SIR, Calcutta, December 24, 1798.

I BEG leave to enclose you two letters which were given me as introductions to you; one by Sir John Macpherson, Bart. and the other by Sir John Sinclair, Bart. who both being well acquainted with the liberality with which science has bestowed on you all her gifts, deemed your acquaintance of the greatest importance to me in attaining the object on which I have professionally come out to India.

I arrived here about two months ago in the Lord Duncan, under the sanction of the Court of Directors, by whom I was recommended to the government here for protection and encouragement in establishing the culture of hemp and flax, as a subject of very great importance to the commerce and national strength of Great Britain, as well as the territorial interests of Asia. I have particular satisfaction in saying what I am persuaded you will read with some pleasure, from an experiment which my friend Dr. Fleming has given me an opportunity of making on a few plants at the botanic garden, that we can obtain, beyond all doubt, from the bembue of this country, which is the can-

nabis sativa of Linnæus, hemp in its highest perfection, and it is this material only which is used in England for cordage; nor in my opinion has the fibre of any plant or tree been as yet found in all respects so well adapted for this purpose, and on which we can so prudently rely. I have not had an opportunity of making any experiments on flax, but I hope the tisy of this country, which is the *linum usitatissimum* of Linnæus, the plants alone in Europe from which this material is obtained, will afford, by proper treatment, flax of a much superior quality. The importance of these valuable plants to a commercial nation such as ours, being found in our territories in Asia of such a quality, will be much enhanced by their being offered on such terms as may not only render us independant of the articles on foreign nations, so necessary for the support of our royal navy and commerce, but at the same time produce a national annual saving of three or four millions sterling. The removal of some restraints, wise regulations in point of freight, and due encouragement, are still necessary. It being the good fortune of Bengal to be under so enlightened a governor as the right honourable the earl of Mornington, his penetrating abilities as a statesman will lead him to hear and discriminate what suggestions may be proper in the two first points of regulation and present restraints; and public zeal will, I flatter myself, induce such a patriot as his lordship to confer that encouragement which may be necessary for so deserving an object, and I hope success will make it a conspicuous object of the public advantages attained in his lordship's government. If my leisure from these pur-

suits may permit, I wish to form some practical and scientific knowledge of the culture and treatment of the other productions of the soil, such as may be necessary for aliment, valuable in commerce, or useful in chemistry, as rice, Indian corn, sugar, silk-worms, cotton, cochineal, Indigo, &c.; and, as few are so capable as you in guiding my pursuits after these objects, I hope you will have the goodness at your leisure of mentioning the proper authors to consult, and persons to advise thereon. Indeed I would have deemed an interview with Dr. Anderson well deserving my going down to Madras, and I would have availed myself of some of the present opportunities, had it not been that my business is before the board of trade, which will not permit my absence just now. My friend Dr. Fleming will do me the favour of putting this letter in your hands; I have received from him every friendship and civility, in consequence of introductions from his friends in Scotland, and he has moreover a keen zeal for the cause. Any commands you may have for me he will take charge of on his return.

GEORGE SINCLAIR.

To George Sinclair, Esq.

DEAR SIR,

Fort St. George, Jan. 7, 1799.

I AM favoured with your letter, together with those from Sir John Sinclair and Sir John Macpherson, regarding your plan of cultivating hemp and flax in these tropical climates.

In respect to flax I have no experience, but have heard that it is cultivated in Bengal for the purpose

of obtaining oil from the seeds, and in this case it might be of use to instruct the natives how the plant might be advantageously manufactured.

The kind of hemp you mention grows up very luxuriantly, as a reed in our gardens here, the culture of which plant has been laid under certain regulations and restrictions by Tippoo Sultaun, as affording a revenue on the best principles, the flowers of this plant being one of those narcotics that, like opium and tobacco, are coveted by the natives of Asia.

The *cannabis sativa*, if memory serves me, rises in Europe with a single stem and pretty entire leaf; but, as this *ginga bang*, or Indian kind, is a very branchy shrub, with leaves deeply intersected, I have hitherto considered it a different species or variety; but as Dr. Fleming assures me that he has raised hemp from Europe seed in the botanical garden at Calcutta, there can be no doubt of the practicability of raising it in any quantity under suitable care and encouragement.

From what I have said, you will observe that the Indians cultivate hemp and flax for the sake of the flowers of the one, and the seeds of the others only: for the purposes of thread, cordage, or coarse cloth, they prepare the bark of *crotalaria juncea*, *asclepias gigantea*, *hubiscus sabdariffa*, and *caunabinis*, and a variety of other plants, nearly in the same manner as the bark of hemp and flax is prepared in Europe. Wherefore it appears that a quantity of suitable materials for cordage may be more readily collected in Hindostan from these than from either flax or hemp, especially *crotalaria juncea*, the *sanap* or *janap* of the natives, which is cultivated to considerable extent in

every part of India for the manufacture of a stuff called gunney, which is in general and common use.

The husk of the cocoa nut has hitherto been the Indian material of ship cordage, and adopted occasionally by Europe ships with advantage; and I am cultivating palm trees, the fibres of the leaves of one of which, the caryota urens of Linnæus, and the singular filaments of another, the sagus gampotoo of Rumphius, as well as the grain of the woody stem or trunk of a third sort, the ganemoo of Amboyna, I am well assured afford the most abundant and best materials for cordage.

Mr. William Webb of this place has lately made cordage of the leaves of the great aloe, that, as I am told, proves to be capable of sustaining four times the weight that hempen rope of the same size can bear, and there can be no doubt that maritime affairs may derive support from this country; our teak is superior in every respect to oak, and it has been uniformly found, that ships built of this country teak last much longer in these seas than any constructed in Europe.

As you have properly referred your business to the board of trade, who, since the institution of the Bengal Asiatic society, must be sensible that we are more deficient in men to do or execute any new work than in speculative science to point it out; my advice is, to abide by their determination, not doubting but that it will prove favourable to your views, and the very laudable intentions of the Court of Directors.

JAMES ANDERSON.

Farther remarks on the Gooseberry Caterpillar.

UNLESS experiments are continued till the particular object desired be fully attained, they are scarcely of any use, as they only occasion perplexity and doubt. Let this be my apology for recurring once more to this subject.

Having been rather late in beginning my observations on the gooseberry caterpillar last season, I had no expectation that the whole could be extirpated in my garden. This made me watch their first appearance this year; and I have had the satisfaction to find, that my efforts to extirpate this destructive vermin have been more successful than I could have expected; for, though I have hitherto examined the bushes in my garden, being in number above a hundred, I have not been able to discover in all above twenty or thirty leaves that have been touched by them, which were of course easily picked off.

The tenthredo caterpillar may be first discovered by the appearance of a few small holes in the leaf, as if they had been pricked by a pin. Where you observe two, three, or more such holes in a leaf, without any kind of discolouring, you will generally find, upon examining the under part of the leaf, that a few of the caterpillars have been hatched, and have each begun to eat; but the creature is now so small, and so much of the same colour with the leaf, that you must examine it with attention before you perceive it. The greatest part of the brood, however, remain still in the eggs, which are found adhering to the larger ribs of

the leaf in regular rows of an oblong shape and whitish colour. These could be very easily discovered by the naked eye, were the leaf above it. From this regular disposition of the eggs upon the leaf, it is evident that they must have been deposited there by the parent fly after the leaf has been formed, and consequently that the eggs have not been preserved through the winter, as one of my correspondents conjectured they were. It is, therefore, in its chrysalis state that the *tenthredo* passes the winter.

If the leaf be allowed to remain a little longer on the stalk, the holes become much more numerous, in consequence of more eggs being hatched. By and by they run into one another, and the whole soft part of the leaf is eaten out; but the fibres of the leaf being too hard for the teeth of the caterpillar in this state, these are left untouched, and they proceed forward till they come to its edges, where they continue in clusters, never quitting it so long as any soft part of the leaf remains; and it is only after the whole is exhausted, and the leaf assumes the appearance of a parcel of dry threads, that they abandon it for another. As the progress of this creature when so small is comparatively very slow, it gives the attentive observer an easy opportunity of thus extirpating the whole if he chooses: for it is some days after they begin to eat before the leaf be wholly consumed; and they adhere to it so firmly as seldom to drop upon another. I have counted as many as a hundred and fifty on one leaf, the one half of which, if suffered to go on undisturbed, would eat up all the leaves that grow on a large bush; so that by taking off this single leaf in

proper time you not only save the whole, but you at the same time prevent the future ravages of those which would have sprung from them.

From this statement of facts, I think it is very obvious, that the ravages of the tenthredo caterpillar may be easily prevented by any one who so inclines; consequently, if any one suffers loss by it, he has only to blame himself for his negligence.

I was not able to discover one of the caterpillar of the *phalæna grossuloriata* in my own garden; but I met with them in that of a neighbour. It proceeds after a very different manner from the former. It makes holes too in the leaf; but these are much larger, more rounded, and more irregular than the former, being sometimes on the side of the leaf, and sometimes in the middle. In short, it more resembles the biting of snails than any thing else. It seems to be one of the solitary class of caterpillars; nor does it fix so steadily to one leaf as the tenthredo. It therefore bites a great many leaves without consuming any one of them entirely, going from one to another, as accident or caprice seems to direct. From this circumstance it is much more difficult to be caught, especially while young, than the other; for you may examine twenty infected leaves without finding one caterpillar. Fortunately, this kind is much less common than that of the tenthredo; and I suppose the *phalæna* lays a much smaller number of eggs. Although I saw, perhaps, a hundred leaves bitten by it, I found only one of the caterpillars, and had not an opportunity of tracing its farther progress.

THE Editor accepts in a friendly manner the strictures of *A. Z.* and shall pay proper attention to the hints he has been so obliging as to offer, though he must not take it amiss if all the things he recommends be not implicitly adopted, as some of his complaints have certainly originated in inadvertence to the circumstances of the case, which he begs leave to notice.

1st. He complains that he has been disappointed in not finding a greater proportion of the work appropriated to agriculture. Now, though it may happen that this correspondent would like it better if the work had been appropriated wholly to agriculture, it does not follow that the Editor is at liberty to alter his plan on that account. By his original proposals he undertook to give one sheet in each number on agricultural subjects, and no more; and it will be found that he has adhered to that rule as nearly as was possible, or could reasonably be expected. This complaint is therefore groundless. Many readers of this work would willingly dispense with that department altogether; but neither is the Editor at liberty to indulge them. In short, while the *Recreations* are continued, the Editor does not consider himself to be at liberty materially to alter his plan; nor will he do so: and, although he once proposed, when an additional sheet shall be given, to enlarge the agricultural department rather beyond its fair proportion; yet he feels there is so much justice in the remonstrances of some of his correspondents against it, that he abandons that idea, and means to adhere as nearly as he can in all respects to his original plan.

2d. *A. Z.* objects to the article on architecture, chiefly because there was a dissertation on the same subject in the *Bee*, which it seems he took in. I regret that he should feel any disappointment in regard to that particular; but he will please to advert, that it was very explicitly declared at the beginning of this work that it was a part of the plan to transcribe from other works such essays as the Editor thought good; so that, if this essay had been fairly transcribed, it does not appear that it would have been in any degree inconsistent with the plan. The *Bee* is a book that had very little circulation in England, and there is good reason to believe that not one in a hundred of the readers of the present work ever saw it. The truth however is, that, though the Editor reserved this liberty to himself, and will avail himself of it whenever occasion shall offer, it has so happened that he has not yet had occasion to do so, for the whole of the articles yet published in this work have been either entirely new, or translations made on purpose, usually abridged, or articles new written, unless it be occasional quotations, or short extracts, such as every writer is in the custom of occasionally adopting in any original work. In regard to the article in question in particular, as *A. Z.* says he has the *Bee*, he cannot but be sensible that there is not a single line in it transcribed from that work. It is wholly written anew, with many additional illustrations. The essay is in itself more of an original than most of those that are offered as such to the public. And if that gentleman had been adverting to that subject, and noticing other writings that have been published respecting it,

he might have observed that since the first publication of it, although it has perhaps never been quoted by any writer, it has evidently been read by many of them: for, since the æra of that publication, the manner of writing on these subjects has been totally changed; as any one who looks back to such writings before and after the year 1793 will soon be convinced of, if he compares them together. The essay, however, was not completed in the Bee; and, as the writer of it sees no prospect that any other person is about to supply what is wanting, it is his intention to do that in the present work; so that the part already published is only an introduction to the other, which would have been unintelligible without it.

The Editor, while on this subject, embraces this opportunity of saying that there are several other essays in the Bee, which were in like manner left unfinished by the abrupt conclusion of that work; some of them that he thinks of considerable importance, which it is his intention, when opportunity offers, to reprint and to complete from the materials now in his hand. Some of these will be given exactly in the words as they are printed, as far as published, and others will probably be written anew. Among these is a few papers on one of the subjects that this correspondent wishes to be enlarged upon, and which the Editor considers as of the first importance, viz. the causes of the high price of provisions in this country; but as his ideas on that subject are by no means of the same sort with those that are in fashion in the present day, and are grounded on facts that are not very obvious to those who have not had equal oppor-

tunities of observing them as himself, he is shy at entering upon them in this work, lest it might lead him into details that might prove uninteresting to many of his readers. From this consideration he has been induced to publish, in a separate pamphlet, some leading ideas on that subject, which he had occasion to throw out in his correspondence with general Washington, and will take occasion soon in the progress of this work to develop some plain fundamental principles on the subject of political economy, which those who incline may easily connect with the other, so as to make a particular application of general principles.

It is very true that Dr. Anderson is the *sole* Editor of this work, and accounts himself personally answerable for every thing in it.

The correspondent *Q. D.* will find his observations nearly answered above. He will please to advert that time is necessary to complete a plan. There are hundreds of subjects that require to be examined; but these must come in succession; and it does not follow, that because they are not as yet overtaken they are lost sight of. Mr. Forsyth's work is in hand; but he does not ride at the gallop. In compliance with the request of this and several other correspondents, Hairbrain's narration shall be concluded in the present volume.

The very polite letter of *G. F. B.* is thankfully acknowledged. It is in a great measure answered above. His other hints shall be duly attended to.

16.

JUNE 1800.

RECREATIONS

IN

AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 4. VOL. III.

AGRICULTURE.

PRACTICAL REMARKS ON THE MANAGEMENT
OF THE DAIRY, PARTICULARLY IN RESPECT
TO THE OBTAINING OF BUTTER.

[Continued from page 176.]

Part 3d. *General management of dairy Cows.*

THE circumstances to be chiefly adverted to under this head are, that the cows be kept at all times in high health and good condition, if you hope to derive abundant returns from the dairy. If the cows are ever allowed to fall very low during the winter, in vain shall you hope to obtain an abundant supply of milk by bringing them into high condition in summer;

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for, if a cow be lean at the time of calving, no management afterwards will ever bring her to yield, for that season, any thing like the quantity of milk that she would have done had she been all the winter in high condition. With this view, she should not only be supplied with abundance of nourishing food in winter, but should also be kept dry, and warm, and clean, by curry-combing, brushing, &c. during that inclement season. Under this point of view, I know no practice that so much deserves the epithet *barbarous* as the general management of milk cows around London, where the poor creatures are seen standing in hundreds together every day during the winter season up to the knees in mire, without a shade to screen them from the wet, or a firm place on which they can lie down. A necessary consequence is, that, although they be supplied with abundance of nourishing food, they pine away, as it may be said, by inches; so that cows which in autumn were in such condition as might have made a respectable figure on the shambles, are reduced before the month of March to the most pitiable state of leanness, exhibiting nothing but the wretched appearance of skin and bone. Having seen this in winter, I was by no means surprised to learn in summer, when they were wallowing in waste, and had regained full flesh, that the average quantity of milk yielded by these cows did not amount to *one half* of what it ought to have been. This is one of the numberless instances of habitual waste and bad management that prevails around this overgrown metropolis, where wealth so much abounds, that economy of any kind, even that which would tend to add to the

comforts of the poor dumb beasts, seems to be considered as a reproach more to be dreaded than that of the most enormous crime.

To avoid this evil in the country, an attentive dairy owner will not satisfy himself with providing hay only, or any other kind of *dry* food, in winter, but will take care to keep up his cows after the grafs fails, and when they are for the most part giving little or no milk, by giving them some turnips, cabbages, carrots, or other nutritive or succulent substances, along with their dry food, which will keep them in fine health and good condition: nor will he deny them some of that succulent food, if he can command it, even after they have calved. For, although turnips and cabbages will impart a taste to the milk if the cow be chiefly fed upon them, yet if she only obtains enough of them to keep her in good condition, it will not be sensibly experienced: and if it were, where calves are reared, that will prove no detriment; and were it otherwise for a few weeks, early in the spring, it is of no consequence; for, the products of the dairy being then scarce, they will always find a market; and the superior quantity of milk yielded, in consequence of this attention during the ensuing season, will do much more than balance a small diminution in price at that season. From these considerations, a judicious dairy owner will always take care to have a provision laid in of some kind of food more nourishing than hay, than such hay at least as is usually made in this country, to keep his cows to their fullest stretch of milk from the time of their calving till grafs can be had in abundance.

The best winter food for cows that I have yet seen, and perhaps the very best that can be obtained in this climate, is the bruised twigs of the common furze, gorse, or whins, as it is differently called (*Ulex Europæus*); for this food not only keeps the cows in the best condition, and in high health, and makes them yield as much milk as upon the top of the grafs in summer, if they be kept in a due temperature as to heat, &c.; but that milk is of as fine a quality, and the butter made from it as sweet in taste and as rich as the best made summer butter. As this plant may be successfully cultivated as a winter feed for beasts in almost every situation, and as it will come cheaper than any other of nearly equal value that I know, I cannot help regretting that the prejudices of mankind should have so far prevailed as to have so long made men shut their eyes against this article. It is ten years since I published full directions for cultivating this as a crop on *good* land; yet I have no reason to believe that ever a single person has once made an attempt to do it, though I am satisfied, from my own experience, that a crop of this is of much greater value than the best crop of clover that can be reared. Because this plant springs up naturally only upon *bad* ground, men have formed their opinions of it from its appearance in that state. I repeat, that it is only on *good* ground it can be reared to advantage as a crop, whatever use shall be made of this information.

Not only do cows require to be very carefully managed in winter, but they must even be petted in summer if a full return be expected from the dairy. If they are constrained to go on pastures where their

ordure has been dropped, they may be wading in seeming abundance, and yet may suffer that degree of want which will much retard the filling of the milking pail. If the grafs has been allowed to attain a considerable length before they are turned upon it, much of it will be trodden down by them, which quickly acquires a putrid taint that they nauseate, and a similar effect will be produced. The same thing will be experienced if it be permitted to get into stalk. If the day be hot, they are incommoded by it, and cannot feed, and flies distress them; and if the night be wet and cold, they are chilled by it: all these are sources of annoyance, which, if not attended to and guarded against, will infallibly diminish the products of the dairy. From these considerations, care should be taken to provide a shelter for them where they can remain cool through the day during summer, and free from any annoyance; in which situation they ought to have fresh and succulent grafs of the sweetest kind that can be obtained cut and laid before them fresh and fresh, in small quantities, as long as they will eat of it; and when they refuse to eat more of it, the whole that remains before them should be swept clean away from their stalls, so as not to suffer them to breathe upon it till they nauseate it; and then they should be left quiet, to rest and ruminate at ease. This kind of management is what is called *petling*. It is even doubtful to me, if care were taken to provide a sufficient variety of delicacies for them in the stall, and those given to them in the most proper manner (that is, always fresh and clean, and as much as possible free from touching the hands of the atten-

dants, or other impurities), whether they might not be made to thrive much better by being kept continually in the stall, and at the same time yield more milk than under any other management whatever; but this I give only as an *opinion*, grounded on partial experiments; not as a fact established on such a firm foundation as to be incontrovertible: but as to the economy of this practice, in as far as respects the expenditure of the product of a farm, it is incontestibly obvious. See *Essays on Agriculture*, Vol. III. *Essay 3d*.

The cow is an animal of much greater delicacy than is by many suspected; and, although she will *live* under great vicissitudes of weather, yet she sensibly suffers by every considerable change of temperature. On this account it happens that no person *knows* the full effect of such changes in augmenting or diminishing the milk, but those who have few of them, and contract a sort of fondness for this animal; by whom, and by whom alone, what I have here said will be fully understood. I believe that a cow, to feel the full enjoyment of existence, ought to be so managed as never to experience a cold below fifty, or a heat above seventy degrees of Fahrenheit's thermometer; and this, it is very obvious, can only be done by the aid of houses properly constructed in this or any other country.

The circumstance respecting attention to cleanliness, above stated, is of more importance than most persons are aware of; for some animals are wonderfully delicate in regard to smells, and among this number the cattle tribe ought to be ranked. It is well known, that rats will never taste any thing that has been hand-

led by man, even in the slightest manner, unless it be overpowered by other stronger smells that are agreeable to them; and on the knowledge of this circumstance do ratcatchers, chiefly rely for their success; but the delicacy of animals in regard to things of this nature is very often of a sort extremely different from that which accords with our notions of that kind. Horses and goats thrive so well together, that some diseases to which horses are subjected, it is generally believed, may be effectually guarded against by allowing goats to inhabit the same house with them, although the smell of the goat be very offensive to our senses; and though cattle evidently dislike whatever food has been handled by man, yet they relish hay or litter on which horses have staled almost above every thing; and attentive persons avail themselves of this peculiarity to excite their appetite and promote their thriving. I suspect, myself, that this is occasioned by the saline impregnation it thus acquires; for it is well known, that cattle and other quadrupeds discover a great liking for salt. But I must not enlarge on this and many other important subjects, lest I tire my readers; for I am well aware, that by many persons those things which they have never adverted to themselves, are deemed not worthy of being adverted to at all. I once knew a man, however, who made a fortune by studying things of this nature; and one of his principal discoveries was, the vast importance of having a continued supply of the purest water that could be obtained, which he found to be of so much consequence to the thriving of his cows, that he would on no account permit a single animal to set a foot into it, nor allow it

to be tainted even by the breath of animals, or other impurities. For this purpose it was received into a wooden trough that was always kept in the neatest order, where it was not allowed to stagnate one moment, but made to pass through it in a continued current.

4th. *Times of Milking:—Necessary cautions.*

Cows, if abundantly fed, should be milked during the summer season three times a day at least, and this at intervals as nearly equal as can be made convenient, viz. early in the morning, at noon, and in the evening, just before night fall.

I believe it is a common practice in most parts of England to have the cows milked no more than twice a day. I mean a natural day of twenty-four hours; but this practice is highly uneconomical. That a cow will yield considerably more milk if that be taken from her three times a day than she would do if milked only twice, is a fact that has been ascertained by the repeated experience of almost every housewife in Scotland; but, like most things of this nature, the precise amount of that augmentation has not been accurately ascertained by the test of fair experiment. Many persons maintain that the same cow will afford an equal quantity at each milking if that be repeated three times in twenty-four hours, as if it were done only twice; so that the gain by this practice, according to their estimation, amounts to a full half of the whole, while others believe it must be somewhat lower than that ratio. I myself am rather inclined to be of the first opinion, though I cannot presume decidedly to say it is so, not having ever subjected it to the test of

fair experiment. But it is a matter of so much consequence, that I very much wish it were done.

At first sight I am aware that it will appear to be extremely improbable that such an increase of milk should be produced merely by a reiteration of the same process; yet, when the following facts are adverted to, this prejudice will disappear.

That the quantity of milk yielded by any female belonging to the *mammalia* class of animals is augmented or diminished in proportion to the degree of suction by the young of that animal, is a fact that has been ascertained by universal experience, as well as by the most unquestionable experiments. We had lately occasion to show (Vol. II. page 473) that in consequence of continued suction by young animals, milk has been drawn from the breasts of women when they were not in the condition that nature usually produces that secretion; and the same thing has happened even to males. This fact being well known, it is a necessary practice among those unkind mothers of the human species, who, deserting the post that nature assigned them, resolve to banish from their embraces, with a cruelty that the most ferocious animals never experience, the tender infant whose very existence was meant to depend upon their maternal tenderness, to take care that the infant be never allowed to touch the breast, because the milk would thus be made to flow in such abundance as to endanger the life of the mother, should the child be hastily withdrawn. Those animals likewise which usually produce a plurality at one birth, as dogs, cats, and others, afford the most demonstrative evidence that the quantity of milk yielded by each is, in some degree, proportioned to the

number of young. If they have four, these are usually fully nourished; if one, two, or more of these be killed, the remainder are little better nourished than the others; if the whole die, the generating of milk quickly ceases, and the mother goes dry. These facts clearly prove that nature intended that the quantity of milk generated in the vessels of the female should, in a great measure, adapt itself to the demand that was made upon her for this nutritious fluid; and of course, that if much be taken away much will be generated, and if little be called for little will be produced.

Nor is this a singular economy of nature. A similar effect is experienced in regard to the generating of blood. If no blood be taken away, none will be generated, and the circulation may be thus continued in a perfect regularity for many years together. But if by accident or design a considerable quantity of blood be drawn off at any one time, nature instantly supplies the want by the secretion at that time of an increased quantity of that necessary fluid. Nay more: if that operation be repeated for some time at regular intervals, nature, still true to her trust, prepares the fluid, as it were, afar off for that operation, by generating the quantity of blood to repair that drain; so that, if it be not in that case drawn off at the accustomed time, the consequences may be very dangerous; of which the following fact is a striking example.

About fifty years ago, Dr. Clarke, an eminent physician in Edinburgh, had accustomed himself for the course of several years to be let blood of regularly once a month. He was a very excellent musician. It so

happened that there was to be a solemn funeral concert performed on the decease of an eminent member of the musical society of Edinburgh, of which body he was a member, upon the very evening of the day on which the doctor, according to his established practice, ought to be let blood of. As the concert could not well go on without his bearing a part in it, and as he could not perform on the violin at that concert if the operation took place at the usual time, several of his friends requested, as a very particular favour, that he would defer that operation till after the concert was over; from a full conviction that this small delay could be attended with no great inconvenience to him. The doctor himself, though more sensible of the danger than they were, desirous to accommodate the company, agreed to their proposal. The operation was deferred; they went to the concert; the doctor began to play a solo on the violin; but while he was proceeding, a blood vessel broke, and he expired in the orchestra; affording too clear a demonstration of the danger of tampering with nature in the usual discharge of her necessary functions.

I knew another singular instance of a still more unusual generation of blood occasioned by a similar cause, which will serve more pleasantly to illustrate the object of our present discussion. It happened while I was a student at the university of Edinburgh. A young woman having been put under the management of an unskilful surgeon for some disorder in which frequent blood-letting was prescribed, he inadvertently performed that operation for a considerable length of time regularly once a day, letting off about four ordinary tea-cups full every time. At length he wished

to discontinue it; but nature had now got into the train of generating so much blood, that he found it to be utterly impossible; for in a short while after the accustomed hour the symptoms of danger became so apparent that there was a necessity of opening the vein immediately. When I saw this woman she had been twelve years in that state, and had been regularly let blood of every day during all that period. She had a plump appearance, and did not seem to have suffered by the operation.

The case appeared to me not a little surprising, and I was at pains to inquire what effect this extraordinary generation of blood produced upon the animal economy, when I found that, like copious perspiration, it had a powerful effect in diminishing the quantity of the natural secretion of another fluid from the body. This is one of the innumerable beautiful economies of nature which we meet with in every step of our progress in investigating her wonders. If one secretion is called for in unusual quantities for any particular purpose in the animal economy, it is furnished, not by a new generation of that fluid, which might tend too much to weaken the frame, but merely by an abstraction from the quantity of excrementitious matter which must at any rate have been discharged from the system, though under a different form.

From these considerations, there seems to be good reason to believe that the quantity of milk yielded by a cow in a given time must be considerably augmented by the frequency of her milking, and the intenseness, if I may use that phrase, with which the operation is performed; so that I conceive that not only must three times milking in twenty-four hours afford more than

twice in the same time, agreeable to experience, but that four times would give still more than three, and so on to a still greater number: but how far this may be carried, or where it will ultimately stop, are not as yet known; so that I consider this to be a proper object of experiment. And what ought to recommend it still farther to notice is, that there seems to be no reason to think that the cow will suffer an exhaustion nearly in proportion to the quantity of milk drawn from her, as this will be in a great measure supplied chiefly by a decrease in the quantity of other excrementitious fluids.

From the above considerations likewise it will appear, that much of the profits of a dairy must depend upon the skill and fidelity of the person who is employed in milking; for, if the whole of the milk that the cow can be made to yield at the time be not completely taken away, the quantity that is left will be reabsorbed into the system, and no more will be generated than what was necessary to furnish the quantity actually drawn off; so that, supposing half a pint more might have been drawn off at that time, you will not only lose that half pint for once, but there will be half a pint less generated for the next milking, and every other milking after that; let another half pint remain at the second milking, a whole pint less will be generated for the third; and so on you may proceed, until no milk at all be generated, and the cow becomes entirely dry; whereas, if the milking had been fairly performed, the cow might perhaps have come to generate even a larger quantity than the first; or, at least might have continued to afford nearly the same quantity for a great length of time, even for

years together, without much abatement if rightly managed in other respects.

In proof of this last opinion, I beg leave to state that I once had a cow which, for a particular purpose, I kept in milk for three years after one calving; and, for aught that appeared, she might have been kept in milk for three times that period, had it been judged proper. It is true she gave rather less milk during the two last years than the first: but this was probably occasioned, in a great measure, by accidental circumstances. A cow in this country can seldom be supplied during winter with food equally proper for generating milk in winter as in summer; and, as the milk is not then so palatable as in summer, nor the operation of milking so pleasing to the person employed for that purpose, it is natural she should then be allowed to shrink in her milk, which would not so naturally flow easily in the spring as if she had had a calf, when there is always a flush of milk produced as to *quantity*; but that milk, that it may be properly adapted to the delicate organs of the young, is much thinner in quality than what may be deemed its ordinary state; so that there is in fact little more real milk yielded at that time than afterwards; as the same effect, unless in as far as respects the digestive powers of the calf, might in a great measure be produced by adding a quantity of water to the milk, and thus augmenting its quantity.

It seems to be astonishing, if any kind of inadvertence could astonish a thinking person, that every dairy owner in the kingdom should be perfectly acquainted with the diminishing process above described (for every one of them adopt that very practice when

they want to lay a cow dry); yet that the necessary effects of the reverse of it should be so little adverted to seems to be not a little surprising. At least we may suppose that this is the case, from observing the little anxiety they discover about the right performance of this very important operation. If a dairy owner were to entrust the charge of half a dozen silver spoons to any servant, it would be judged a criminal degree of inattention not to take a regular notice of them from time to time to see that no imbezzlement had taken place; but here he thinks nothing of intrusting the milking, perhaps, of a hundred cows to a parcel of servants without controul, when by their negligence he may lose the whole value of his spoons a hundred times over in one season. We shall soon see additional reasons for this kind of attention; but these alone, one would think, ought to be sufficient to excite a very wakeful degree of attention to this particular.

On yet another account ought the owner of a dairy to be extremely cautious in the choice of the milkers. If the operation be harshly performed it becomes painful to the cow, but if gently done it seems rather to give pleasure; and, as the cow possesses the singular faculty of being capable of retaining its milk at pleasure, it greatly behoves the owner to get such milkers only as are gentle and pleasing to the animals themselves. I have known several instances of cows who would not let down a single drop of milk to one dairy maid, who let it flow in abundance whenever another approached her; exhibiting unequivocal marks of satisfaction in the one case, and of sullen obstinacy in the other. For the same reason, when the cows are ticklish, they should be treated with the most soothing

gentleness, and never with harshness or severity; and when the udder is hard and painful, it should be fomented tenderly with luke-warm water, and stroaked gently to bring the poor creature, if possible, into good humour; for in this case she will let down the milk without restraint, so that the milking will operate upon the future generation of milk after the same manner that the sucking of her calf would have done; whereas if she retains her milk, and does not allow the whole to be drawn off freely, it must operate after the same manner in regard to the future production of milk, as we have showed above that imperfect milking would have done. It is well that in this case, as in many others, interest pleads the cause of humanity. How beautiful are all the laws of nature when they are clearly understood.

But a still more powerful reason for being attentive to see the very important operation of milking properly performed, and the management of cows in other respects more carefully adverted to than has been customary, will appear from the following facts that have been ascertained by me by means of experiment and a careful attention to practice for many years, which, for the sake of being more easily remembered, I have thrown into the form of aphorisms. But, as these facts and the corollaries deducible from them would not do well to be separated, and as, when taken together, they would greatly exceed the boundaries appropriated to this head, I shall defer entering upon this branch of the subject till the next number of this work.

[*To be continued.*]

NATURAL HISTORY.

OBSERVATIONS ON INSECTIVOROUS INSECTS.

For Dr. Anderson's Recreations.

[Continued from page 191.]

SIR,

I HAVE read with much pleasure and satisfaction your Recreations in Agriculture, Natural History, &c. but more especially that part of them which treats on Entomology, as it flatters me with a hope that it will increase the labourers in a science little known and less cultivated in this country. For want of a proper knowledge of insects; the natural-history of Great Britain is in a very imperfect state, and must continue so, until more persons, and in very different situations, engage in the pursuit. One great reason for the neglect of this branch of natural-history is, the want of some proper work in our native language to engage the attention of the tyro, and to furnish him with the means of acquiring the outlines of the science; another circumstance that checks the young inquirer is, the utter impossibility in most situations of meeting with some proficient to consult, or to whom he could communicate his discoveries; for, excepting the metropolis, or within a few miles of it, scarce an entomologist is to be found, though there are many persons whose observations would be truly valuable if they were preserved and pursued. To these may be added a third and more serious objection, which is, the contempt in which the study of insects is held by many sensible and intelligent persons of both sexes.

Your excellent essays will, I hope, remove the first difficulty, and stimulate the curiosity of those who have leisure and opportunity, to examine and investigate the economy and properties of such minute animals as fall within their notice. It will not only increase their happiness by expanding the mind, but will also remove that tedium which is too often felt in the country when young persons have no interesting pursuit. The second will of course vanish, if we can induce those who have made this branch of knowledge their study, but whose modesty or timidity may have hitherto prevented their making themselves known, to come forward and contribute their mite to the general fund.

The third objection can only be overcome by reason, reflection, and a due and mature consideration of the subject, turning the mind to the all-wise Creator, to whom man, in common with the most minute animalcule, owes his existence. The inquirer into nature will soon perceive the omniscience and omnipresence of the Deity; he will observe that these minute beings are a necessary and very useful part of animated nature, and that they are preserved and governed by laws immutable, and directed by unerring rules of order and perfection far beyond the reach of human wisdom to comprehend.

Let no presuming impious railer tax
Creative wisdom, as if aught was form'd
In vain, or not for admirable ends.
Shall little, haughty ignorance pronounce
His works unwise; of which the smallest part
Exceeds the narrow vision of the mind? THOMSON.

Insects hold a more distinguished place in the grand scale of nature than at first appears. They not only furnish man with various articles of luxury and use, but serve also for food to quadrupeds, birds, and fishes.

For animals subsist on animals in infinite descent;
And all so fine adjusted, that the loss
Of the least species would disturb the whole. THOMSON.

A slight attention to the economy of insects would enable the farmer and gardener frequently to preserve their crops and choicest flowers from destruction, by enabling them to discern the destroyer, and to discriminate between the friend and the foe; it would encourage them to spare, where before they would have been inclined to punish, and to rescue from death many friendly insects that, through ignorance or inattention, would have been condemned to destruction. I am led to these reflections by your essay on the insects which destroy the leaves of the gooseberry tree; and, although with your correspondent *Juvenis* I commend that paper, and admire your interesting reply to his questions, and the means you propose to rid gardens and fields of slugs and noxious insects, yet permit me to recommend extreme caution ere the fatal verdict of condemnation be passed, that it may not be done hastily or wantonly, but with the greatest care and circumspection; for we certainly have no right, either through wantonness or caprice, to deprive of life an harmless and inoffensive animal, created for some wise and beneficent purpose, and holding its proper place in the grand chain of nature. It has often appeared to me of serious consequence, that

children at a very early age are taught to despise and destroy these minute beings, instead of having their minds framed to early inquiry, as to the use and importance of what they so cruelly torment; not even considering that what appears to them so disgusting in its first or primary state, they would cherish and admire in its perfect one. That the groveling caterpillar, or filthy maggot, as it is often denominated, would, if undisturbed, produce an elegant butterfly or beautiful moth. This improper bias given to the mind in infancy, frequently produces the most unpleasant and pernicious effects in riper years. How often do we see persons, who in common occurrences are not deficient in courage and resolution, shudder at the sight of an harmless spider, and scream and appear ready to faint on the approach of a wasp? Never considering that let them, and they will let you alone. If any excuse can be admitted for destroying so many little beings, it is the preservation of our bodies, our viands, or those species of vegetables that are our daily food. The celebrated Linnæus has published a dissertation under the title of *Noxa Insectorum*, in which he points out a number of pernicious species; but if we were to include all the insects that devour the leaves, and pervade the trunks of trees, secrete themselves in seeds and fruits, infest our clothes, and penetrate into the bodies of animals, it would render the catalogue very extensive indeed. The power of insects is immense; for what they cannot accomplish by strength they effect by numbers, and how weak are the efforts or reason of man, to withstand their ravages when sent as a scourge by the Almighty!

But such is the divine wisdom that their numbers are limited, and bounds set to their mischief; for, notwithstanding their inimitable skill in providing for their young, which, different from most other animals, they never live to see, yet their numerous enemies are constantly on the watch to supplant them, and those who, by extraordinary foresight, elude the search of the larger animals, become a prey to insects themselves; for insects are by far the greatest destroyers of insects, and we find the sagacity and penetration of one of these extraordinary beings is overcome and rendered futile by the superior instinct of others. The *Formica-leo*, described in your last number, is a remarkable instance of this, to which we may add the various species of spider, whose artful toils are obvious to every common observer; but there are thousands who work in secret, and whose admirable and almost imperceptible labours can only be detected by the more curious and penetrating investigator. I shall endeavour to select a few of these, which may not be generally known, and thus point out to the farmer and gardener some of the friendly insects which they ought to cherish rather than destroy. Happy for this country the most destructive species are here scarcely known but in cabinets.

The *Gryllus Tartaricus* and *migratorius*, more generally known by the name of locust, the *Phalæna calamitosa* and *graminis*, the *Musca frit*, and many others that do unspeakable damage in other countries, never visit us in such numbers as to occasion any alarm, though of some of these a single insect is sometimes found. One of the most destructive insects in

this country is the *Aphis*, or *Puceron*, which does an immensity of mischief by rendering the plants it attacks sickly, often even unto death. Fortunately its enemies are numerous; and, if properly attended to, they might be used to advantage. Among insects the larva of the *Coccinella*, lady cow, or lady bird, an insect well known, is the greatest, for it lives entirely on the *Aphides*, and destroys them very rapidly. There is also a large family of the genus *Musca*, whose larvæ are all aphidivorous; to which may be added the *Hemerobius* and *Ichneumon Aphidum*. These, if encouraged, would soon rid the plants of this pernicious insect; but, unfortunately, the gardener observing a caterpillar in the neighbourhood of a fine rose, or other beautiful flower, is too apt to seize it with indignation, and crush it beneath his foot, when perhaps this animal, if left alone, would rid the plant of its lousy disease.

A considerable number of insects in their perfect state, on the contrary, destroy the larvæ of others; such as the genera *Sphex*, *Empis*, *Ichneumon*, &c. which are insectivorous; but the *Ichneumon* acts in a manner different from all the rest. The females of this genus are furnished with a tube curiously inclosed in a double groove or case, that keeps it safe from injury. This tube is pointed at the end, and acts as an awl to pierce, at the same time that it serves as a channel or passage to the eggs [a good figure of this tube with its proper case may be seen magnified in Trans. Linn. Society, Vol. III. Pl. 4, fig. 5], and this tube varies in length according to the size of the insect, or the part it is destined to perform. In some

it is nearly inclosed in the abdomen, and scarcely projects beyond it; in others it is very visible, and I have seen an *Ichneumon* fly whose tube was at least two inches long, and nearly double the length of its whole body. The insects of this genus do not confine themselves to one particular class or genus of other insects, but nature seems to have provided an *Ichneumon* for each particular species; and Linnæus has not only given descriptions of a great number that live in the bodies of larvæ in general, but has also given the name of *Ichneumon Larvarum* to a particular species, and there are likewise *Ichneumon puparum*, *ovulorum*, *Aphidum*, &c.

The *Ichneumons*, notwithstanding they feed on the inside part of caterpillars, are both gregarious and solitary; for in some cases the parent deposits but one egg, in others two, and in many species to the amount of twenty or thirty. Those in general of the larger kind who have little or no tube fix their egg on the skin of the larva or caterpillar near the head, and attach it so firmly that the afflicted animal cannot remove it. The young when hatched makes its way through the under part of the shell into the body of the animal, feeding on its interior substance until it is full grown; but what is scarcely credible, the foster parent continues to eat and even increase in size until the parasite has received its full portion of nourishment, when it comes out, changes to a *pupa*, and nothing but the bare skin of the caterpillar remains. In many instances the *Ichneumon* pierces the skin, and deposits the eggs in the inside to the number, as I have before observed, of twenty or upwards; and,

though it may be less extraordinary that one single larva of this wonderful genus should have sufficient instinct not to touch the vital part of its fostering nurse, yet that such a number so closely confined should not do it, is beyond all comprehension. When this numerous brood are full fed, all the individuals of it quit their confinement, and spin little silken cases each for himself, in which they make their second change, and remain till the time arrives for their bursting forth in their fly or perfect state. These little silken cases may be daily seen under the copings of garden walls, and near them the empty skin of the caterpillar of the white garden butterfly, which nourished them. Those that attack the pupa can have no more nourishment than what the insect will afford, it being then in an inert state; but a much smaller portion of food must be sufficient to nourish the animal which attacks the Aphis, and still less that which lives in the eggs of butterflies and moths. This seemed a matter of great surprise to Reaumur and De Geer, two celebrated naturalists, who speak of it with admiration and astonishment. But what would those gentlemen have thought, had they lived to have seen Mr. Kirby's account of the *Ichneumon inserens*, *Tipulæ* and *penetrans*, with their delicate apparatus, so accurately and elegantly described in the Transactions of the Linnean Society, Vol. V. page 96, tab. 4?

The insects above mentioned perform their operations openly, but those with the long tube find the nidus for their young in places far removed from our sight. The *Ichneumon manifestator* [Trans. Linn. Society, Vol. III. page 26] lays its eggs in the larva

of a species of bee called *Apis maxillosa*, concealed in a hole at least an inch deep, the aperture of which is curiously closed up by the parent animal. To enter into a full description of all the species of ichneumon would far exceed the bounds allotted to any of your correspondents, and therefore I shall conclude, by repeating my desire that my fellow-labourers may increase, that the botanist, the farmer, and the gardener, would attend to entomology, as connected with their other pursuits; and that those who have time and opportunity would receive with cordiality, and profit by, that inimitable lesson of Solomon, "Go to the ant, thou sluggard, consider her ways and be wise."

ENTOMOPHILUS.

The above paper came to hand just as I was about to acknowledge the receipt of the favour of H. G. H. with the box accompanying it, containing the caterpillars, &c. and to tell him that it was the caterpillar of the *Phalæna grossulariata*, and that the little flies which proceeded from it were of the ichneumon tribe, which had sprung from eggs that had been deposited in the body of the caterpillar by the parent fly, where they had been hatched, and afterwards nourished, while in their larva state, by devouring, as it was gradually produced in the body of the phalæna caterpillar, that fatty substance which abounds in the body of every species of caterpillar, and which is the material that is at length converted into silk in many kinds, and to a glutinous substance in others, that is necessary for the purpose of forming those cases called *cocoons*, in which

the change from the larva to the pupa state is effected. As that paper explains in a beautiful manner the intention of this surprising economy of nature, it supersedes the necessity of the illustrations that I might have otherwise judged proper. It is only necessary for me to add, for the further information of my correspondent, and of others to whom this economy of nature is new, that in all cases where the ichneumon fly has deposited its eggs in a caterpillar, they infallibly prove the destruction of that caterpillar at last; though, for the most part, the number of eggs is so proportioned to the size of the caterpillar in which they are lodged, as to afford them just abundance of food to sustain them, without attacking the vital viscerae, until they have attained their full size, when the ichneumon caterpillars either form their small silken cocoons in the inside of the body, and there undergo their transformation through the chrysalis into the pupa state; or they eat their way through the skin in their caterpillar state, and form their cocoons in a cluster without (as in the specimen sent); in either case the exhausted caterpillar on which they fed expires in that state, without ever being able to form a cocoon for itself, so that it never produces a fly of its own kind. When natural history began to be cultivated as a science, many persons seeing one or more living flies proceeding from the body of the caterpillar, believed it to be the genuine natural progeny of that caterpillar, which occasioned at times mistakes that produced considerable embarrassment; but this phenomenon has now been a long time very generally understood.

The destruction that is made among caterpillars by

means of the tribe of ichneumon flies is sometimes prodigious, so that perhaps not one in a hundred of these caterpillars arrives at its pupa state. This depends entirely upon the number of ichneumon flies in that neighbourhood at the time; and it much behoves those whose interest it is to check the ravages of the caterpillar, as my correspondent justly observes, to cherish and encourage the breed of ichneumons as much as possible; for this species of fly does no hurt to vegetables at all: and, although it is natural to behold, with a kind of horror, a small insect that insinuates itself into the body of another, there to gnaw its viscera, and thus slowly to exhaust the vital powers; yet prudence requires us to protect them in our own defence, as we do cats and other carnivorous creatures which search for those vermin as a prey that would otherwise elude our power. Nor can there be a doubt, that were we sufficiently acquainted with the natural instincts and faculties of the animal creation in this respect, but we might have it in our power to free ourselves, without trouble or expence, from the ravages of every species of insect, however minute or numerous they may be; a thing that, without this aid, must in many cases far exceed the utmost limits of human power. I feel myself, therefore, much obliged to my ingenious correspondent for directing the attention of my readers towards this very important department of science; and I beg leave to recommend an attention to those classes of animals that devour others, especially among the insect tribe, as one of the most useful objects of pursuit that can engage the attention of my young readers especially. What

ought to encourage him greatly in this walk is, that this department of science has been hitherto so little cultivated, that it is impossible for any one who engages in it seriously, not to make many great and important discoveries that will necessarily insure respectability to himself among his compatriots, while it will at the same time engage the mind in a pleasant occupation that will never fatigue; though it affords a never ceasing employment to the mind, while it, at the same time, induces such habits as in the most natural manner tend to promote bodily health in a most eminent degree.

On an undescribed Disease of the Gooseberry Bush.

To the Editor of Recreations in Agriculture, &c.

SIR,

I AM much pleased with your frequent recurrence to subjects of utility in rural economies, and hope you will continue to give us information on these subjects from time to time. I am satisfied that your account of the gooseberry caterpillar is correct, and that it may be rendered harmless at least, if it cannot be extirpated by the measures you recommend; for I have followed it exactly, and am fully sensible of the benefit I have already derived from it. I have also tried what you recommend respecting slugs, which have done me unspeakable damage this season; but though I have destroyed immense numbers within the last month, they are still so numerous that I begin to doubt if I shall be able ultimately to extirpate them,

but I shall persevere. A friend advised me to try to get a parcel of sea gulls and put them into my garden, which is walled round; for he says the gulls touch no sort of vegetable, and as they do not scrape with their feet, living entirely upon slugs and other soft insects, I am determined to try them, and have already taken measures to procure some of them. If I should prove successful I shall let you know the result of this experiment.

The intention of my troubling you at present is to inquire if you, or any of your correspondents, (shall you be so good as publish this in your *Index Indicatorius*, or otherwise) can give me any information respecting the cause and cure of a disease that I have observed affects some of my gooseberry trees that I never took notice of before, though it is perhaps very common.

Toward the beginning of May I observed some of the leaves of one of my bushes covered all over with a number of small dark-coloured spots, not above the size of pins points; there were no holes. These spots gradually augmented in size, and became more conspicuous, and then appeared of a dark brownish colour, inclining to the violet. As these grew larger the general colour of the leaf became pale and sickly, gradually acquiring a yellowish hue. The spots now became very conspicuous, and spreading wider cover nearly one half the leaf. Soon after they had attained this state I observed that the stalk of the leaf had become brittle, so that the slightest touch made it break short, over just where it adhered to the stem. In a few days the leaves began to drop off, and gradually accumulated in heaps about the bottom of the bush,

leaving the stalks naked with the berries only adhering to them.

At the first view, a bush in this condition bears a near resemblance to one that has been stripped of its leaves by means of the caterpillar; and I am persuaded I may have often seen this disease before without remarking it, having concluded that it had been bared of its leaves by the caterpillar; but a slight attention will enable any one to distinguish between these two cases. When the ravage has been done by the caterpillar the foot-stalk of the leaf adheres still to the stem, and no leaves are to be found below; in this case the branches are more completely bared, and the leaves are found thick strewed on the ground. The consequence of both, I presume, is nearly the same in regard to the fruit; for I can have no doubt but the berries will never attain maturity.

There is great reason to believe that these spots are the effect of the operations of an insect; but it must be one of a kind different from the caterpillar, and of a very minute size, for no appearance of any kind of animation can be discovered by the naked eye, or even by a single lens, and I had no other glases to examine them. I request what information you can give respecting this disease; and if it be unknown to you, I hope you will be so obliging as to give this an early insertion in your *Recreations*, to direct the attention of observers towards this subject at the present time, when, I make no doubt, but it may be perceived in many gardens.

Wishing success to your laudable undertaking, I remain, with esteem, sir, your most humble servant,

A YOUNG INQUIRER.

MISCELLANEOUS LITERATURE.

On the variations of Heat above and below ground.

To the Editor of Recreations in Agriculture, &c.

SIR,

Woodbridge, May 3, 1800.

I HAVE a long time wished to trouble you with a few lines upon a subject which has for many years engaged my attention; and I flatter myself that you will admit as an apology for calling your attention off matters of more importance, that an earnest desire of information leads me to seek, through your means, some communication with persons conversant in meteorological pursuits, from which my retired situation wholly precludes me. Last year I was induced to place a thermometer a few inches below the surface of the earth, from a desire of noting the increasing warmth of that element, and comparing it with the progress of vegetation; in short, a number of ideas, which I wished to confirm, or correct, led me to pay as much attention to this experiment as a very infirm state of health would permit. I shall not attempt to make any particular observations at present; but only request you to suggest to any person, that I shall be happy to commence a set of experiments in any way, or upon any plan that they may think most fit and convenient. The short time that I have been enabled to keep a register of the increase and decrease of the earth's heat, will be a sufficient reason for my abstaining from any conclusions; but at the same time there are some queries naturally arising from the variations that I have observed, which can be best answered by comparing registers kept in different si-

tuations, and for a considerable length of time. Light showers, lightning, a cold but drying wind after a heavy rain, cause a material alteration in favour of warmth: and continued dry weather with or without sun-shine has appeared after a time to diminish the warmth, or to render it a bad conductor of the heat of the sun's rays. A gentle shower produces almost an immediate change, and the accumulation of heat is considerable.

I have made a hasty sketch of my mode of applying the thermometer. Sinking a flower pot into the earth with a bamboo perforated with numerous holes, I suspend the thermometer in the centre by a piece of cork or wood covered for three inches with woollen cloth, and which fits very closely into the bamboo, and excludes the air. The tube rises an inch above the bottom of the flower-pot, and is surrounded with fine sand level to its top; after the thermometer is thrust into the tube, I place another flower-pot, filled with the soil of the garden, and covered with woollen cloth, within this, which rests upon the sand, and fits sufficiently close to exclude the air. One pair I place in a strawberry bed, and another in an open spot of light earth; the depth about ten inches. Another I have introduced horizontally through a brick parapet wall which enclosed a part of the garden, and I was enabled to exclude the external air very effectually from this. The result was, that they tallied in both situations. Many variations may be made; and, as this is only a rude and undigested plan, I shall gladly pursue any other, and thankfully attend to any suggestions which you or your friends may do me the favour to supply: sufficiently rewarded if I can any way ex-

cite or assist in the investigation of what appears hitherto to be considered (except by a very few individuals) in a very desultory way.

I have added two specimens of an abbreviated journal; the hours I can readily vary as may be most convenient to others, and any form will be equally convenient to me; Barrington's appears as convenient as any. My desire is to obtain a series of observations, which, from previous arrangement, may correspond as to time of day and the mode of conducting the register, so far as to allow of comparing them with each other, though made in different and far distant districts. As my avocations confine me to one spot, and to very regular hours, it is my earnest wish to render myself of some trifling service in this department if it be possible. Professional engagements have of late, and will for some weeks occupy much of my time, and must plead for the hasty letter which I now write you. A friend going unexpectedly from hence to-morrow induces me to snatch a favourable opportunity of getting this conveyed without expence. I am, sir, your obedient and humble servant,

P. LATHBURY.

The highest and lowest degree of Thermometer daily from April 15 to 28, in the air and in the earth.

	Air.	Earth.	Air.	Earth.	Air.	Earth.	Air.	Earth.
1799.	H	H	N	N	H	H	N	N
April	8 A.M.	12	4 P.M.	8	37.39	lightning.	8	8
15, Wind N. E.	40.38	43.39	40.39	37.39	46.46	light shower.	46.46	46.46
16, N. E. E. S. E. calm	41.39	49.40	50.43	47.45	47.45	hard gale, 1 h. P. M.	47.45	47.45
17, S. W. S. W. by S.	49.44	52.45	51.46	47.45	47.45	two hours duration.	47.45	47.45
18, S. W. by S.	44.44	51.45	49.44	47.44	47.44	showers, much rain.	47.44	47.44
19, S. S. W. by S.	46.43	47.44	45.44	47.44	47.44	showers, cloudy.	47.44	47.44
20, N. W.	45.41	49.43	45.44	43.47	43.47	squally showers.	43.47	43.47
21, N. W.	31.43	45.43	40.39	39.38	39.38	squally showers.	39.38	39.38
22, S. by W.	40.40	47.44	46.43	43.43	43.43	gale of wind.	43.43	43.43
23, E. by S. E. N. E.	44.39	50.42	47.42	42.42	42.42	squally rain.	42.42	42.42
24, N. E.	44.42	48.42	43.41	39.41	39.41	gale of wind.	39.41	39.41
25, N. E. W. N. W.	41.41	42.41	44.41	40.42	40.42	much rain.	40.42	40.42
26, N. W.	40.40	44.41	42.39	37.39	37.39	rain, squally.	37.39	37.39
27, N. W. squally	41.39	43.39	44.39	38.39	38.39	snow and rain.	38.39	38.39
28, N. W.	42.39	45.39	44.39	38.39	38.39	rain.	38.39	38.39

Height of thermometer from 8h. at night Saturday, 1795. Sunday night.

Woodbridge, lat. 52° 12' Sandy vale water running from N. W. to S. E. to the river Deben.

Month.	Day.	Age.	Hour.	Weather.	Wind.
Jan.	Sat. 24	4	8h. P. M.	Haze.	N. E.
			11h.	Clear.	N. W.
			2h. A. M.	Hazy.	W.
			$\frac{1}{2}$ 8h. A. M.	Clear.	W. N. W.
			12h.	Clear.	W. S. W.
			4h.	Clear.	E. S. E.
			8h.	Cloudy.	S. E.

Thermometer.	Barometer.
5" above 0	In. 29 $\frac{5.5}{100}$
2" below 0	In. 29 $\frac{7.0}{100}$
18" above 0	In. 29 $\frac{7.0}{100}$
20" below 0	In. 29 $\frac{7.0}{100}$
23" below 0	In. 29 $\frac{7.0}{100}$

Variation 25" $\frac{1}{2}$ in twelve hours.

The highest and lowest degree of the Thermometer in seven days for thirteen weeks—February, March, and April.

	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
	H	H	H	H	H	H	H	H
1799. Sun 7h. 27m.	8 A.M.	12	4 P.M.	8 P.M.	12	4 P.M.	8 P.M.	12
Feb. 1 to 10,	21.30	40.25	25.35	22.34	25.35	22.34	25.35	22.34
10 to 16 inclusive	41.29	45.34	46.33	46.28	46.33	46.28	46.33	46.28
17 to 23,	46.31	53.33	53.32	46.31	53.32	46.31	53.32	46.31
24 to March 2,	40.38	56.47	56.42	47.36	56.42	47.36	56.42	47.36
3 to 9,	46.33	50.35	48.34	43.30	48.34	43.30	48.34	43.30
10 to 16,	37.32	48.35	41.33	35.31	41.33	35.31	41.33	35.31
17 to 23,	45.32	47.35	47.33	40.32	47.33	40.32	47.33	40.32
24 to 30,	42.26	47.31	41.29	42.21	47.31	41.29	42.21	42.21
Mar. 31 to Apr. 6,	41.26	41.29	41.29	40.27	41.29	40.27	41.29	40.27
7 to 13,	44.37	50.38	50.37	45.35	50.37	45.35	50.37	45.35
14 to 20,	49.37	52.43	51.40	47.37	51.40	47.37	51.40	47.37
21 to 27,	44.40	50.42	47.43	46.37	50.42	47.43	46.37	46.37
Apr. 28 to May 4.	48.42	51.40	50.40	47.38	51.40	50.40	47.38	47.38
Sun rises 4h. 46m.								

Observations suggested by the above, by the Editor.

IT is with extreme pleasure that I give all the publicity I can to the above very liberal and ingenious proposal; which, if carried forward, cannot fail to be productive of consequences that may prove highly beneficial to science; how much so, no one can pretend to say; but even the few hints above given point at circumstances in physics that were not before suspected; and, if prosecuted, would probably bring into view many important facts that are not at all known.

One circumstance that I think may possibly deter some persons from prosecuting this set of experiments, who might otherwise be inclined to do it, will be, the difficulty of making the observations with the apparatus above described. On which account, I wish it could be so altered, as better to suit those who have not inclination to subject themselves to much trouble. With this view, I beg leave to query, whether it might not tend to facilitate the observations, if the stalk of the thermometer were to be made so long as to have that part of it on which the degrees are marked rise so far above the surface of the earth, as to admit of being observed without being moved out of its place, whatever was the depth of the bulb? This part of it that rises above the ground might be covered by an inverted flower-pot, to prevent it from danger; or, which would be still better, by a wooden or tin case, with a small door to open, or windows for observing the variations. The bulb, in this case, might be closed round with the natural earth itself, without any extraneous body

intervening, which may possibly in some cases affect the result of the experiment. And, as it appears that rains or dews affect the result, the tube might be carried so far horizontally under ground, as to remove the bulb from under the cover that the case might afford.

I beg leave to suggest likewise, that a considerable difference may be experienced in the result of these experiments, not only from the nature of the soil in which it is buried, but also in respect to its state of permeability. The nature of the soil, therefore, in which the thermometer is buried, ought to be described as accurately as possible; for some soils are known to imbibe moisture more readily than others, and to retain it longer; and, I have no doubt, are better or worse conductors of heat, arising from their colour, and many other circumstances. And a soil that has been fresh dug, and is in a mellow state owing to frequent stirring in a proper manner, absorbs the gentlest dew, and becomes kindly moistened by it; while that part of it which has become hard and consolidated, in consequence of lying long untouched, remains as dry and hard as a piece of stone, though it be exposed to the very same atmospherical influences. Let us say then, that the soil above the place where the bulb is buried shall be turned over carefully to as great a depth as can be safely done, precisely once a week; and well raked and smoothed, without being pressed down.

But even after these circumstances had all been adverted to, I should have some hesitation in drawing decisive conclusions from comparative experiments of

this class made by different persons in distant places, were it only on account of the danger of inaccuracy in the instruments with which the experiments must be made. Few instruments in common use are so carelessly made as thermometers; and, indeed, the nicety that is required is such, that the most perfect instrument-maker would scarcely make two that, if placed exactly beside each other in the same place, should in all cases indicate the same precise degree of heat; for, although they were made with such perfect accuracy, as that if they were both placed in any degree of heat you please to name, which continued without variation for hours together, they might both indicate precisely the same degree on the scale at the end of that time; yet, let that degree of heat be changed, and it is a hundred to one if one of them will not be more *sensible* than the other; that is to say, be sooner affected by the change, so as to rise or fall more quickly than the other; in which case their range will be different. Nor is it possible to avoid this; for the smallest variation in the form or proportion of the bulb will occasion it.

Of all the liquids that have ever been adopted for the purpose of a thermometer, quicksilver is the most sluggish, and is affected in the lowest degree by a variation of the heat; and this very circumstance has brought it into more general use than any other; because it is the only one that, for comparative trials, can possibly be so made, as to indicate, under any circumstances, precisely the same degrees of heat. There are only two degrees of heat known, that it is in our power to continue for so long a space as to give

time to the fluid in the thermometer to become stationary at these points so long as to admit of their being marked with certainty; these are, the boiling of common water, and the thawing of ice; which, if the barometer be adverted to, can be continued for hours together without variation. The bulb, therefore, being first put into one of these liquors, and continued there till it becomes perfectly stationary, that point may be marked; and afterwards, the same bulb being put into the other medium and detained there till the mercury becomes stationary in the tube, and that point also marked, the lowest or freezing point being the thirty-second degree on Fahrenheit's scale, and the highest two hundred and twelve, you have to divide the intermediate space into equal parts, so as to correspond with these numbers; then extend the same scale of equal parts above and below these points as far as you incline, and the work is completed: for the variation in the width of the small bore of the tube is seldom so considerable as to deserve notice. But, unless the bulb be very small, it would require, even with quicksilver, a very long tube; and when the tube is short the degrees become proportionally short, so as to be scarcely perceptible. Hence it becomes impossible to measure very small variations of heat with such thermometers.

To get rid of this difficulty, thermometers are often made that have a shorter range. For the common purposes of observing the weather in this climate, from twenty degrees to eighty is reckoned a sufficient range. In this case, no other point can be ascertained with precision but the freezing point alone; all the rest

must be guessed at, by comparison with one of the first kind. In some cases, where the heat becomes stationary for a considerable length of time, an individual thermometer *may* be made that shall be tolerably correct; but this is so seldom regarded by those who make thermometers for sale, that there is not, perhaps, one in a thousand that has even this degree of accuracy; and not two in ten thousand that would indicate the same points, while both were to indicate a change of heat that had lately taken place.

From these considerations, I confess that I place little reliance on comparative statements of heat, as indicated by the thermometer at different places at the same time. And as the great object that I should think ought to be aimed at in the present set of experiments, would be to ascertain, in the first place, what the circumstances are that occasion a temporary change from heat to cold independent of the direct influence of the sun, I should imagine that my correspondent might go on with a set of experiments for that purpose perfectly well, even should no other person whatever co-operate with him. Indeed, till something of this kind be done, the experiments that he proposes could afford no accurate conclusions; because many variations would be produced by unknown circumstances, which would tend rather to confound than enlighten. I should, therefore, think my ingenious correspondent, who seems to be so well qualified for bestowing the attention necessary in such a case, would do a most acceptable favour to the public, should he proceed in the career he has so happily begun. It would, I hope, afford one of his disposition no unpleasing amusement,

to observe and to publish his remarks from time to time; and I should think myself honoured by being permitted to lay them before the public, when he shall think it proper.

In the meanwhile, as the best return I can make for his obliging condescension on this occasion, I should farther beg leave to suggest, that the observations in the column which indicates the changes of the weather should be greatly augmented; and that the observer should mark down with great precision the circumstances that he thinks has occasioned any remarkable discrepancy between the thermometer above and below ground; for it is much more likely that these circumstances should strike him, than one who only casually glanced at his tables; and, as much must depend upon the state of the thermometer above ground, the situation of it should be particularly adverted to.

From the experiments of professor Wilson, of Glasgow, it has been ascertained, that a very great difference in the heat or cold is experienced, on some occasions, by raising or depressing the thermometer only a few inches from the ground. This circumstance, therefore, ought to be adverted to. Let us suppose, that one thermometer is sunk three inches, another six, another nine, another twelve inches under ground (and as much farther as shall be judged proper); and that one is placed at one inch, another at one foot, another at three, and another at six feet above the ground, all under the same circumstances: these, if observed at the same times, and the variations of weather marked, would soon give room for many very interesting reflections.

The thermometers above ground should be screened from the direct influence of the sun, though exposed to the influence of the air. For this purpose, let a glass cylindrical tube be provided, of about two inches in diameter, open at both ends. Let a cylindrical case of milled iron, about four inches in diameter, be put over this, open at both ends, but having a conical coping by way of roof to defend the thermometer from rain. Suspend the thermometer in the inside of the glass tube; and let that glass case be so fixed within the iron case, as that they should remain at an equal distance from each other all round. Have a door in the case opening to the north, for the purpose of observing the thermometer. Let two stakes be fixed firm in the ground, one to the east and the other to the west, at the distance of about three feet from each other, joined at top by a cross bar; between these the case may be firmly fixed by means of small laths nailed across. The air would thus have a free circulation, though the sun could in no manner affect it. Were all thermometers which are kept as a register thus preserved, and placed in an open situation, we should obtain a much more correct idea of the heat of different places than we now have; and the expence of this apparatus is so trifling as to be not worth naming.

For the purpose here chiefly wanted, which I conceive to be to ascertain, in the first place, the circumstances that occasion a variation between the degree of temperature above and below ground, I humbly conceive that an air thermometer would be, upon the whole, the most eligible instrument. For, although

there be difficulties attending the use of it where the absolute degrees of heat are to be compared, yet it indicates small variations of temperature with so much greater accuracy and promptitude than any other, that I should think it would deserve a preference here to all others; and it would be easy so to manage it here as to obviate the principal objections that lie against it. The simplicity of its construction, and the facility with which it may be observed, are additional recommendations. I am sorry that this instrument is so little known, and, on that account chiefly, so seldom employed.

An air thermometer consists simply of a small glass tube with a ball blown up at one end of it; but, instead of being filled with some unelastic fluid, as other thermometers are, it is only filled with air: the end of the tube is, of course, left open. When it is to be fitted up, the ball ought to be subjected to the greatest degree of heat that it is ever intended to indicate (let us suppose blood heat); and, in doing this, the whole of the tube, as well as the ball, should be subjected to the influence of this heat for some time. The open end of the tube should then be immersed in a vessel containing some tinged liquor, such as water, where it is not to be subjected to a freezing cold; or, which is still better, vitriolic acid, as it is more weighty and not so liable to evaporate. The bason should have a pretty wide surface, like the bason of a barometer, and for the same reason. When things are thus adjusted, no sooner does the cold diminish, than the air within the ball contracts, and the fluid of course rises in the tube to a height proportioned to the degree of contraction. Let us

suppose that it is so constructed, as that when the cold is at the freezing point it just reaches the ball; then, as the freezing point is at thirty-two, and the blood heat at ninety-six on Fahrenheit's thermometer, it follows, that if the whole tube were divided into sixty-four equal parts, marking that at the top thirty-two, and the others regularly downward, it would correspond exactly with Fahrenheit's scale.

But in this case a difficulty occurs. As the whole weight of the atmosphere rests on the surface of this bason, as it does on that of a barometer, it follows, that when that weight increases, it will tend to cause the liquor to mount in the tube, though no variation in the degree of heat should be experienced; so that the thermometer can only indicate the exact degrees of heat while the barometer remains stationary at the same height it stood at when it was first adjusted; and, of course, the *absolute* variation can never be ascertained without adverting to the state of the barometer at the same time. These are the conveniencies and the defects of this instrument: but, with all its defects, I still think it the most convenient for the purpose here required; for, as the barometer often remains stationary nearly for months together, were a scale adapted for correcting the errors it might occasion, it would not be so difficult to adjust as may appear at first sight.

With a view to this kind of adjustment, let us suppose that the thermometer was put up so as to be true at the average height of the barometer at the place where it is to be used. In order to ascertain the variation that takes place in the height by the pressure

of the atmosphere alone, independent of a variation in the degree of heat, let the thermometer with its bason be introduced into the receiver of an air-pump, in an apartment in which, by means of another thermometer, no change of temperature is experienced; let the pump be gently worked, so as to raise the mercury in the barometer one inch, and if any heat shall have been generated by this operation, which may be measured by another thermometer introduced into the receiver for that purpose, let it stand till it acquires the former temperature. Mark then the rise that has, in consequence of this, taken place in the thermometer. This done, exhaust the receiver, until the mercury sinks two inches, observing the same precautions as before, and mark once more the height of the fluid in the thermometer. Divide the space of tube included between these two marks into twenty equal parts, and one of these divisions will mark the barometrical variation (if you please to admit that phrase) that is produced on the thermometer by a rise or fall of one tenth of an inch in the barometer. This done, it will be easy to adjust a sliding index like a *nonius* to a metallic plate divided into degrees of the same length as those of the thermometer; so that the variation of one, two, three, or more, tenths of an inch, either above or below the medium height, may be added to, or taken from the thermometrical height at the time, so as to admit of its being registered in a moment with the utmost facility and precision. For example: let us suppose, that an inch of rise in the barometer raised the liquor in the thermometer one degree, and that the thermometer indicated a heat of sixty degrees, while the baro-

meter stood at half an inch above the medium height; in that case, the true thermometrical height for the register would be sixty degrees and a half; for it will be recollected, that the highest numbers are towards the base of the tube of the thermometer. If, on the contrary, the barometer had fallen an inch below the medium, then the thermometer would sink one degree below its true place; so that, if it stood at sixty, it ought in this case to have indicated fifty-nine, and so it should be marked. And after the same manner every elevation and deprefion of the barometer should be allowed for. In this way, the absolute variations of heat might be ascertained with tolerable precision; even when the variations of the barometer were considerable. And where the barometer was stationary, the relative variations of heat would be ascertained with perfect precision. But to guard against any inaccuracy that might accidentally take place in reducing them, it would always be advisable to mark in the journal the actual height both of the barometer and thermometer at each observation, as well as the reduced height; for thus it would be in the power of any one who examined the register to discover an error, if any should take place, and to correct it. Each individual thermometer, it ought to be observed, would require to be adjusted by itself, and to have its own separate barometrical scale; as nothing else could pretend to any degree of accuracy, where the absolute heat was to be ascertained; but many uses could be made of this kind of thermometer for indicating changes of temperature, even where this adjustment was neglected; where the barometer was adverted to, so as to be certain it was

stationary at the time the experiments alluded to were made.

With this kind of thermometer the smallest variation of temperature would be rendered plainly perceptible; and thus a great number of observations might be made with much satisfaction to the experimenter. It appears from the judicious remarks of my correspondent, that a sensible increase of heat is experienced below ground, upon the falling of a copious dew or a very moderate rain after a long continuance of dry weather. This is a most interesting fact; and it deserves to be traced through all its variations, so as to discover the circumstances that tend to retard or accelerate, to augment or to diminish it.

In like manner it appears, that the proportional heat below ground, when compared with that above it, is rather diminished during a long continuance of dry weather, as well as during a continued wet season. These facts require to be carefully examined, and the circumstances, if possible, ascertained that tend to make rain cease to produce heat below ground, and to generate cold in its stead.

It is of much importance that those variations which naturally take place between the thermometers in the air and under ground, in consequence of the diurnal revolution and the consequent absence or presence of the sun when the weather is settled and invariable, should be carefully ascertained, so as to be distinguished from those accidental variations of the atmosphere arising from other causes; and this can only be done by a long continued train of careful observations, as has been done of late to ascertain the diurnal

variations of the barometer. For example, though the barometer is liable to be affected by many accidental variations in the atmosphere, yet Dr. Balfour, by a series of very accurate observations (see Asiatic Researches, Vol. IV), has ascertained, that, within the tropics at least, the barometer experiences the following diurnal variations with great regularity, though subject to accidental derangements, viz.

1st. It constantly *fell* between ten at night and six in the morning.

2d. It *rose* between six and ten in the morning.

3d. It *fell* between ten in the morning and six in the evening.

4th. It *rose* between six and ten in the evening.

Here we discover a regularity that has not till of late been suspected, although the barometer has been an object of very general attention for the greater part of a century past.

It is probable, that other periodical changes regularly occur respecting this instrument, that have not yet been adverted to, owing to the difficulty of making continued observations, and the frequent derangements that occur from extraneous causes.

There can be little doubt but the variations of heat that will be experienced in the air will be more frequent than those under ground, as arising from the influence of the sun; but, if the thermometers be screened from the wet, and from the influence of the wind, it is probable it will suffer less from extraneous circumstances. A thermometer which is exposed to the wind must, in a damp state of the atmosphere, indicate a great degree of cold, owing to the evapo-

ration on its ball, which would not otherwise be experienced. On the other hand, from my correspondent's observations it would seem that a genial augmentation of heat must be experienced under ground without any variation in the influence of the sun, when a mild summer shower falls, that will not be at all felt in the air. Many other deviations will, no doubt, be discovered, if the observations be long enough continued.

I confess that I am more anxious to have the regular progress of the comparative variations above and below ground traced in any one place, than to have a number of comparative statements from different places before these changes have been ascertained.

It would be a most desirable thing to have a series of observations continued for as long a period as might be at all hours of the day and night, both of the barometer and thermometer; but this is difficult to be executed. With regard to the barometer, however, we know that it can be, and has been done, by drawing a paper moved by clock-work, and marked with lines corresponding to the days or hours, so as to pass over the point of a pencil that is moved upwards or downwards as the mercury in the tube rises or falls; but hitherto it has been deemed altogether impossible to obtain any thing of the same sort with regard to the thermometer. It seems, however, not to be impossible to do this with the air thermometer, as the tube is open at the end, and the fluid rises and falls in that tube in the same manner as in the barometer. But I must be satisfied with barely suggesting this hint, having already dwelt too long on an article

which, to many of my readers, will prove, I fear, but little interesting.

Thoughts on the circumstances that constitute the essence of grandeur and sublimity in works of art.

[Continued from page 202.]

IN continuation of the remarks on architecture, it would seem to me, that too little attention had been bestowed by artists of this class to the sensations that the structures they respectively designed were best fitted to produce; in consequence of which, many incongruities have been admitted which might have been easily avoided. Perhaps, the church of St. Paul, Covent Garden, is the chastest specimen of architecture exhibited by Inigo Jones in this country. Yet it does not produce an instinctive effect upon the mind of any one; and it is only by those who have been accustomed to reason on this subject, that it comes to be at length, and not without some difficulty, accounted worthy of approbation. By recurring to the first sensation I felt on looking at that church, I can perfectly recollect, that, instead of an impression of grandeur, it appeared to me rather mean and insignificant; it suggested as much the idea of a barn as of a temple. By degrees, it assumed a somewhat higher degree of estimation in my opinion; but, after all, it is only by being compared with others that it comes to assume that kind of superiority which I am willing to allow to it. Its excellence then cannot be called absolute, but merely relative; and this, in matters of taste, is but a very slender degree of excellence.

When I try to discover what can be the cause of this debilitated power of effect, it seems to me very plain, that it is owing to the incongruity that subsists between the style of its architecture and the *size* of the object. The architecture is of the plainest and most simple kind, which is naturally calculated only to excite ideas of grandeur and sublimity; but the diminutive size of the building does not accord with that idea. Beauty and elegance were all that the size of the structure would admit, and these alone should have been attempted. Had the building been of great magnitude, and the materials proportioned to it in point of apparent firmness and durability, it would then have been altogether calculated to produce a concordant sensation of sublimity. At present the walls, apparently plastered, convey a strong impression of meanness, which so perfectly accords with its smallness of size, as almost totally to obliterate the other impression: nor is this in any manner done away by the unusual projection of the cornice, which, under the circumstances mentioned, bears too near a resemblance to a shade reared over a butcher's stall, to admit of its being happily connected with the idea of grandeur or sublimity of any sort.

I specify this particular structure, because, with all its defects, it appears to me to indicate, that the man who designed it had some idea in his mind of the power of effect which he wished to attain, and which is scarcely discoverable in the works of any of the other artists in this island except one, who shall be noticed by and by. All the others seem to have had no other aim than to make their structures as like to some other structures as they could; and, provided

the proportions of their columns were the same, no matter what was the difference in point of size, or distribution of parts; all was well, and they were satisfied.

I do not know any work of art that is so totally divested of the power of exciting sensations of pleasure in the mind of one who is strongly susceptible of such emotions, as one of those modern piles that we now denominate a *royal palace*. Such, for example, as that at Hampton Court. Look at either the garden or the river front: at a distance or near. What are the sensations it excites? At a distance, it conveys the idea of a clumsy mass of unbroken wall scarcely rising above the ground. If light be reflected from the windows, it might be mistaken for a range of hot-houses. Near, it seems to be a still more weighty mass, that is sinking into the ground. None of the pillars are either of such a size, or of such bold projections, as to excite even a faint impression of grandeur; and when you look along the wall, it is such a flat uninteresting surface, broken into such a number of unmeaning parts, and all these so ill defined, that it conveys the idea of extent without dignity, and expence without elegance; so that, instead of the pleasure we expected, it produces only lassitude and disgust. Other royal palaces of modern date (not even excepting that designed for Whitehall by Inigo Jones, which has been so accurately engraved as to enable any one who chooses to form a correct idea of what it would have been, when aided by the specimen of it that was executed at the Banqueting Hall, Whitehall, is no exception to what has been said. So that it

occasions no regret to me when I reflect that never more of it was executed.

Sir Christopher Wren, in the model he has left of his own favourite design for St. Paul's Church, departed less from the simplicity that accords with the idea of grandeur, than in that which he was obliged to execute, and it had, besides, more of originality in it: but the simplicity respects only its external form. Internally, it would have been more complicated, and would have deviated more towards what the Italians call *capriccioso* than the present structure. It was, however, an attempt to excite certain sensations in the mind of the beholder which he contemplated with pleasure, and which, therefore, deserves to be ranked as a deviation from the enervating idea of servile imitation.

No artist seems to have been more sensible of the inefficacy of those imitations to impress the mind with pleasurable sensations, than sir John Vanburgh; from those, therefore, he purposely deviated as widely as he could: nor can any of his designs, whatever faults they may possess, be ever accounted tame. Yet, though he delighted in rearing large and costly fabrics, he never had the good fortune to exhibit one that has been unequivocally admitted to be either grand or sublime. This seems to have been occasioned by his mind having been at first strongly impressed with ideas suggested by ruins of a magnificent kind, and his not having been at the pains to connect these vivid impressions with those that might have been made by more entire objects, had suitable objects of this kind fallen in his way. However this may be, it is certain,

that he had studied more than any other architect that we know, to throw his structures into such a form as admitted of those bold projections and towering elevations which form the characteristic features of stately ruins. They fail, however, in producing the idea of grandeur that is often excited by ruins when viewed near at hand; because the solid walls of an entire building prevent the view of those large and separate parts which are usually seen in ruins, and which the mind can so easily connect together as to form one great consistent whole, which the imagination can pourtray in the most vivid colours. In the perfect structure, when viewed near, the strong projecting parts, on the contrary, hide the view of the rest of the building; so that its real magnitude can never be perceived. It seems to be not so much a whole as a congeries of separate parts; which, though from their boldness they may appear to be wonderful, can never excite that calm expansion of mind which is felt when we contemplate those objects that we denominate grand or sublime. When viewed at a distance, however, they appear finely picturesque; and in this particular the works of sir John Vanburgh rise proudly eminent above those of all modern masters. In this respect, and perhaps in this respect alone, are they entitled to great applause.

There are not wanting artists at the present day who have given indications of talents of a very superior kind; though it must depend upon accident, I presume, whether these talents can be so fully appreciated in their own day, as ever to give them a fair opportunity of displaying them to advantage; for the

experience of all ages has sufficiently proved, that talents alone are not sufficient to insure celebrity to an artist in his own life-time: and in the line of architecture especially, it is talents of another sort than those which constitute his excellence as an artist, that usually recommend him to those who alone have it in their power to give full scope to the efforts of genius in this line. To this circumstance we must attribute, very often, that acknowledged inferiority in public works to what might have been exhibited in the age in which they were produced. This is one of those evils which man is doomed to experience in this world, and to which he must submit, because the imperfections of human nature are such as forbid that it ever should be otherwise. We may regret that it should be so, but never can prevent it.

On Scotticisms and Anglicisms.

[Continued from page 66.]

Obscure Passages in Shakespeare illustrated.

WHEN Hamlet says, that a man might "his quietus make with a bare *bodkin*," no one can now understand what tool can be meant by the word *bodkin*. One commentator will have it to be a Roman *stylus*, another a large needle used by the ladies for particular purposes, and so on; each succeeding commentator refutes the conjecture of his predecessors, and adds some new one of his own. At last comes the laborious Steevens, who, after producing a score of passages from obscure writers whom nobody knows, satisfies himself that it must be some tool peculiarly attached

to the business of a taylor; but what that tool is he has not yet been able to discover. The fact, however, is, that the bodkin alluded to by Shakespeare was as well known by me, while yet a boy, as a knife or a spoon would have been, had he had occasion to use them. Steevens is perfectly right. It is a very rude and simple tool used by taylor, for no other purpose than that of forming eyelet holes; and consists of the smallest leg-bone (*tibia*) of the sheep, broken through about the middle where it is smallest, and there sharpened to a point; the thick part at the knee-pan forming the handle. I hope this explanation of a tool which, if not in use at the present hour, was certainly so in England when Shakespeare wrote, and in Scotland when I was a boy, will put an end to all farther conjectures on that subject. I shall beg leave to adduce one other example in illustration of another obscure passage in this justly esteemed author.

Shakespeare makes use of the verb *to scale* in a sense that none of his commentators can understand, as it is not now in use in that sense in England, though it probably was the root from whence the English verb *to scale*, now in use, was originally derived; and it has, of course, greatly puzzled the commentators. Without losing time in quoting their conjectures, I shall only briefly state, that the first and original meaning of the verb *to scale*, denoted "the same operation with respect to *solid* bodies of such a size as admit of being *measured*, that is denoted by the English verb *to spill* when applied to *fluids*." Both these words are still in use in Scotland; and it is there as common to say, "Do not *scale* the corn,"

meaning, to take care that it does not fall out by inclining to one side the vessel in which it is contained, as it is to say, "Take care not to *spill* the milk." What word is equivalent to this in English? or if there be any word at all that can express this idea, I do not know; but I rather suspect, that, in conformity to the usual stile of *refinement*, the single verb to *spill* must be obliged to perform both offices.

Be this as it may, the secondary sense in which this verb was applied is borrowed from the first, and by an analogy quite common in all languages, the effect is in some measure substituted for the cause. As the consequence of *scaling* corn is to make it disperse, and to spread abroad to a much wider extent than it formerly occupied, the same word has been adopted to denote "the separation of a multitude of people after they have been brought together in a crowd for any purpose whatever." Hence it is, that when a congregation issues from church after divine service, and separate, each taking his own way, it is called "the *scaling* of the church;" and in this sense it is that Shakespeare has used it. From this, again, is derived the third meaning of the verb *to scale*, which is still in use; for as the dispersion of the people may be either voluntary, as when they depart from the church or playhouse after the business for which they went thither is ended, or involuntary, as when Cromwell dispersed, or, as the Scots of that day would have said, *scaled* the parliament; the phrase thus came to be applied "to the agent who occasions the dispersion, instead of the objects which are thus compelled to disperse." And as the assailants who attack ram-

parts must necessarily occasion the defendants to disorder if they prove successful, these assailors come to be called *scalers*, and the operation by which they mounted to the assault *scaling*. Thus it happens, that by preserving the original meaning of a word we frequently are enabled to trace the progress of ideas, and to point out a natural connexion between things, that when the primary idea is once lost can never be discovered.

I am aware of the commonly received etymology of the verb *to scale*, from the Latin *scala*; nor shall I enter into an argument with any one who holds that opinion. All that I shall say on that head at present is, that there is no doubt that our learned lexicographer was so fond of Latin, that he has derived many pure Saxon words from the Latin without a cause; and that there is some reason to think this may be among the number. We, no doubt, along with the French and Italians, have borrowed many words from the Latin; but our word *ladder* is not of that number, though theirs be so. That the French word *escalade* is evidently derived from their word *eschelle* will not be denied; and as it coincides in sound with our word *scaling*, we believe it has the same origin, though it is very evident, that if it be derived from the Latin, it must have been by a very different process from that adopted in the French. I am the rather inclined to think, that the English verb *to scale* is only incidentally connected in sound with the French *escalade*, and not derived from it; but that the true etymology is as above set forth, from this consideration, that the word would have been undoubtedly applied to Cromwell

when he dispersed the parliament; for they would have said he *scaled* the parliament, though the French phrase of similar import, had we derived that word from the same source, could not be used; for no one would ever think of saying that he dispersed them *par escalade*.

If then English writers, instead of that senseless abhorrence which they discover against every peculiarity in the Scottish dialect (which, in fact, is only old English with a somewhat peculiar pronunciation), would carefully examine its peculiarities, and, while they rejected every word that was unnecessary or superfluous, would adopt and naturalise such words only as were evidently useful and necessary, they would very soon effect a great improvement: and if, together with that, our philologists would study, with much more attention than has been the fashion of late years, the language of the English version of the Bible, they would do still more service to the cause for which I at present contend; for then they would be compelled to avoid that inaccurate use of words so common in our day, which tends to confound all language, and to introduce a chaos of confusion, which must end, if not speedily restrained, in babbling, nonsense, and eternal wrangling. But this is the natural consequence of the general use of a dictionary, in which there are not, perhaps, ten words of the language accurately and properly defined, where they have not been copied from other dictionaries; and this, we have reason to regret, that the vanity of the compiler has so often prevented.

Allow me to add the word *hung*, when it denotes

“the privation of life by suspending the body of an animal by the neck,” to the too numerous list of *Anglicisms* which owe their existence to that species of refinement whose essence consists in a retrograde progression. In old times the word *hung* was only employed to denote *hung beef*, or other inanimate objects suspended in the air for the purpose of being dried; but when such suspension was for the purpose of “extinguishing life,” *hanged* was universally adopted. Thus the traitors who had conspired against Ahasuerus were “both *hanged* (not *hung*) on a tree” (Esther ii. 22); and, again, Ahasuerus tells Esther (ibid. viii. 7), speaking of Haman, “and him they have *hanged* (not *hung*) upon the gallows.” Ahithophel also, when he saw that his counsel was not followed, “saddled his ass, and arose, and gat him home to his house, to his city, and put his house in order, and *hanged* himself.” (2 Sam. xvii. 23.) Those persons, therefore, who have been accustomed from their infancy to read the Bible, which chances to be more frequently the case with the natives of the northern than those of the southern parts of this kingdom, are much shocked at the indelicate idea conveyed by this modish transposition of terms. And what good reason, may I ask, can be assigned for this innovation? When a language has once got two appropriate terms to denote with precision two distinct ideas, is it not a degradation of that language to banish one of them, or use it in a different sense? Thus, if I say, “Jeffrey was *hanged*, and afterwards *hung* in chains,” can any one object to the propriety of the expression? Do not the words convey two very distinct ideas? the one, “the privation of life by means

of a well known operation;" the other, "the suspension of a lifeless carcase for a particular purpose:" why then shall we confound these ideas by the more faulty expression, "he was *hung*, and then *hung* in chains?"

I should be inclined also to think that the verb to *hing* (now nearly obsolete), with its preterite *hung* or *hinged*, declined through all its tenses, after the same manner as to *swing*, *swung*, or *swinged*, had originally a distinct meaning from the verb to *hang*, with its preterite *hanged*, though these two words, from their near similarity of sound as well as sense, have been long confounded, in consequence of that inaccuracy which inattention so often introduces into language; but of this I speak only by conjecture, not having any classical authorities prepared to quote in support of this opinion. But whether this was ever the case in former times, or not, it would certainly be an improvement in our language, both in point of energy and elegance, were we in future to employ the verb to *hang* in all its tenses in no other sense than that of the privation of life by suspension as above said; employing the verb to *hing*, with its derivatives, invariably to denote the suspension of inanimate bodies only for any purpose whatever. This would not occasion the introduction of any new word, but merely the replacing of a word that is beginning to grow obsolete to its original rights and legitimate prerogatives. It is in this way that I would wish to see the *jus et norma loquendi* vigorously supported, and not, by allowing every silly boy to encroach upon these rights, by abandoning or transposing words at one time as the whim struck him, and then banishing them for

ever because they had been once so inconsiderately dropped, though their want was deeply felt.

The Linden (Lime) Tree. By the late Sir James Foulis, Bart.

The following little poem has been handed to me as the composition of the late Sir James Foulis, of Colington near Edinburgh, whose virtues were much less known than they deserved to have been. The lines themselves, from the soothing plaintive strain they breathe, exhibit evident proofs of their being his genuine production. It affords me a sensible pleasure to have been accidentally employed as the means of preserving this small memorandum of one to whom, in my younger days, I lay under many obligations, and for whose memory I shall ever entertain the sincerest respect.

J. A.

ARISE, fair Linden, haste, arise, and spread
Thy boughs to hide me in their grateful shade!
You must have perish'd, tender yet and young,
Choak'd by th' unkindly parent whence you sprung;
Transfer'd to freer soil and opener air,
You grew and flourish'd by my guardian care:
These hands, with kind attention, by thy side
Plac'd this fair plant, that, like a blooming bride,
Ascends thy trunk, and on thy boughs lays hold,
Clings round and round in many an amorous fold,
And breathes ambrosial fragrance on the tree,
From flowers which nature has denied to thee.
Hither, when spring thy annual green renews,
With willing feet I come to court the Muse:
The Muse that, long a stranger to my breast,
While rougher cares my erring mind possess'd,
Her late repentant votary not disdains,
Nor coyly shuns him on these peaceful plains.
Thus, when a few revolving years have pass'd,
(What voice can tell how soon appears the last)

When my short destin'd course on earth is o'er,
 And I must hail thy much-lov'd shade no more?
 Thou too, fair tree, although indulg'd by fate
 With lengthen'd life beyond the human date,
 Though warm with suns, and rich with fostering dews,
 Returning spring thy annual green renews,
 The time must come when thou shalt waste away,
 And that strong frame, like this frail flesh, decay;
 When spring shall never clothe thy boughs again,
 And suns shall rise and dews descend in vain.
 E'en while the canker'd tooth of Time would spare,
 Perhaps, for sordid gain, some wasteful heir,
 Whose untaught mind intent on lowly views,
 Ne'er felt the raptures of the heavenly Muse,
 While all the feather'd songsters mourn around,
 With cruel steel thy stately trunk shall wound,
 And spread thy blooming honours on the ground;
 Thenceforth condemn'd along the miry road
 To creak and groan beneath some cumb'rous load.

E'en then, some gentle breast that comes this way
 Shall stop, and view thy vacant place, and say,
 "An ancient man, his name I have forgot,
 "Of times resorted to this favourite spot,
 "And spent whole hours beneath a linden tree;
 "The mark where once it grew you still may see;
 "And thus he sung; "When gay ambition led
 "My wandering steps her slippery paths to tread
 "Through toilsome years, what numerous ills I bore,
 "From storms at sea, and dangers on the shore?
 "On the cold ground I snatch'd a short repose;
 "The summer scorch'd me, and the winter froze;
 "And death in various forms his terrors spread,
 "The rage of battle thundering round my head.
 "Go now, fond man! compute thy mighty gains;
 "Bring home the harvest reap'd with so much pains.
 "Oh years ill-spent! O vainest of mankind,
 "To sow the barren sands, and reap the wind!
 "Here threats no danger; here no cares molest;
 "Nor hopes nor fears alternate tear my breast;

“ My gentle sovereign, in these peaceful shades,
“ Reigns without force, and without speech persuades:
“ While taught,”—“ But, ah! I’ve now forgot the rhimes
“ I learn’d with so much care in former times;
“ And oft have sung them all the livelong day;
“ But years have worn their traces much away,
“ And in my memory nothing now remains
“ But some half periods, some imperfect strains.
“ What can resist a change from length of days,
“ Since e’en the vigour of the mind decays?”

Remarks concerning the Savages of North America.

The following observations were communicated by a nobleman who is not less distinguished as a patron of literature than for his knowledge of the relative interests of nations, and the circumstances that promote the comforts of domestic life. This paper will afford an excellent specimen of his judgment in selecting persons who are capable of giving a discriminative view of the objects they contemplate. Had we notices of all different nations, done with the same perceptive discrimination as those of this writer or Gorani, we might be almost contented with travelling in our elbow chair. The Editor considers himself much obliged by this communication, and would be happy if he could find many such.

SAVAGES we call them, because their manners differ from ours, which we think the perfection of civility. They think the same of ours.

Perhaps, if we could examine the different manners of different nations with impartiality, we should find no people so rude as to be without any rules of politeness, nor any so polite as not to have some remains of rudeness.

The Indian men, when young, are hunters and warriors; when old, counsellors; for all their government

is by counsel of the sages. There is no force, there are no prisons, no officers to compel obedience, or inflict punishment. Hence they generally study oratory, the best speaker having the most influence. The Indian women till the ground, dress the food, nurse and bring up the children, and preserve and hand down to posterity the memory of public transactions. These employments of men and women are accounted natural and honourable. Having few artificial wants, they have abundance of leisure for improvement by conversation. Our laborious manner of life, compared with theirs, they deem slavish and base; and the learning on which we value ourselves, they regard as frivolous and useless. An instance of this occurred at the treaty of Lancaster in Pennsylvania, anno 1744, between the government of Virginia and the Six Nations. After the principal business was settled, the commissioners from Virginia acquainted the Indians by a speech, that there was at Williamsburg a college, with a fund for educating Indian youth; and that if the Six Nations would send down half a dozen of their young lads to that college, the government would take care that they should be well provided for, and instructed in all the learning of the white people. It is one of the Indian rules of politeness, not to answer a public proposition the same day that it is made; they think that it would be treating it as a light matter, and that they show it respect by taking time to consider it, as of a matter that is important. They therefore deferred their answer till the day following; when their speaker began by expressing their deep sense of the kindness of the Virginia government in making them that offer; "for we know," says he,

“ that you highly esteem the kind of learning taught in those colleges, and that the maintenance of our young men while with you would be very expensive to you. We are convinced, therefore, that you mean to do us good by your proposal, and we thank you heartily. But you, who are wise, must know that different nations have different conceptions of things; and you will therefore not take it amiss if our ideas of this kind of education happen not to be the same with yours. We have had some experience of it: several of our young people were formerly brought up at the colleges of the northern provinces; they were instructed in all your sciences; but when they came back to us they were bad runners; ignorant of every means of living in the woods; unable to bear either cold or hunger; knew neither how to build a cabin, take a deer, or kill an enemy; spoke our language imperfectly, and were therefore neither fit for hunters, warriors, nor counsellors; they were, in short, good for nothing. We are, however, not the less obliged by your kind offer, though we decline accepting it; and, to show our grateful sense of it, if the gentlemen of Virginia will send us a dozen of their sons, we will take great care of their education, instruct them in all we know, and *make MEN* of them.”

. Having frequent occasions to hold public councils, they have acquired great order and decency in conducting them. The old men sit in the foremost ranks, the warriors in the next, and the women and children in the hindmost. The business of the women is to take exact notice of what passes, imprint it in their memories (for they have no writing) and communicate

it to their children. They are the records of the council, and they preserve traditions of the stipulations in treaties one hundred years back, which, when we compare them with our writings, we always find exact. He that would speak rises. The rest observe a profound silence. When he has finished and sits down, they leave him five or six minutes to recollect; that if he has omitted any thing he intended to say, or has any thing to add, he may rise again and deliver it. To interrupt another even in common conversation, is reckoned highly indecent. How different this is from the conduct of a polite British house of commons, where scarcely a day passes without some confusion, that makes the Speaker hoarse in calling to order; and how different from the mode of conversation in many polite companies of Europe, where, if you do not deliver your sentence with great rapidity, you are cut off in the middle of it by the impatient loquacity of those you converse with, and never suffered to finish it!

The politeness of these savages in conversation is indeed carried to excess, since it does not permit them to contradict or deny the truth of what is asserted in their presence. By this means indeed they avoid dispute; but then it becomes difficult to know their minds, or what impression you make upon them. The missionaries who have attempted to convert them to christianity all complain of this as one of the great difficulties of their mission. The Indians hear with patience the truths of the gospel explained to them, and give their usual tokens of assent and approbation: you would think that they were convinced. No such

matter. It is mere civility. A Swedish divine, having assembled the chiefs of the Sasquehannah Indians, preached a sermon to them, acquainting them with the principal historical facts on which our religion is founded; such as the fall of our first parents by eating an apple; the coming of Christ to repair the mischief; his miracles and sufferings, &c. When he had finished, an Indian orator stood up to thank him. "What you have told us," says he, "is all very good. It is, indeed, bad to eat apples. It is better to make them all into cyder. We are much obliged by your kindness in coming so far to tell us those things which you have heard from your mothers; in return, I will tell you some of those which we have heard from ours. In the beginning, our fathers had only the flesh of animals to subsist on, and if their hunting was unsuccessful they were starving. Two of our young hunters, having killed a deer, made a fire in the woods to broil some part of it. When they were about to satisfy their hunger, they beheld a beautiful young woman descend from the clouds, and seat herself on that hill which you see yonder among the blue mountains. They said to each other it is a spirit that, perhaps, has smelt our broiling venison, and wishes to eat of it: let us offer some to her. They presented her with the tongue; she was pleased with the taste of it, and said, Your kindness shall be rewarded: come to this place after thirteen moons, and you shall find something that will be of great benefit in nourishing you and your children to the latest generations. They did so, and to their surprise found plants that they had never seen before, but which

from that ancient time have been constantly cultivated among us to our great advantage. Where her right hand had touched the ground they found maize; where her left hand had touched it they found kidney-beans; and where her backside had sat on it they found tobacco. The good missionary, disgusted with this idle tale, said, What I delivered to you, were sacred truths; but what you tell me, is mere fable, fiction, and falsehood. The Indian, offended, replied: My brother, it seems your friends have not done you justice in your education; they have not well instructed you in the rules of common civility. You saw that we, who understand and practise those rules, believed all your stories: why do you refuse to believe ours?

When any of them come into our towns, our people are apt to crowd round them, gaze upon them, and incommode them where they desire to be private; this they esteem great rudeness, and the effect of want of instruction in the rules of civility and good manners. We have, say they, as much curiosity as you; and when you come into our towns, we wish for opportunities of looking at you; but, for this purpose, we hide ourselves behind bushes where you are to pass, and never intrude ourselves into your company.

Their manner of entering one another's villages has likewise its rules. It is reckoned uncivil in travelling strangers to enter a village abruptly, without giving notice of their approach; therefore, as soon as they arrive within hearing, they stop and hollow, remaining there till invited to enter. Two old men usually come out to them and lead them in. There is in

every village a vacant dwelling, called the stranger's house. Here they are placed, while the old men go round from hut to hut, acquainting the inhabitants that strangers are arrived, who are probably hungry and weary; and every one sends them what he can spare of victuals, and skins to repose on. When the strangers are refreshed, pipes and tobacco are brought; and then, but not before, conversation begins, with inquiries who they are, whither bound, what news, &c. and it usually ends with offers of service, if the strangers have occasion for guides or any necessaries for continuing their journey; and nothing is exacted for the entertainment.

The same hospitality, esteemed among them as a principal virtue, is practised by private persons; of which Conrad Weiser, our interpreter, gave me the following instance. He had been naturalized among the Six Nations, and spoke the Mohock language well. In going through the Indian country to carry a message from our governor to the council at Onondaga, he called at the habitation of Canesdego, an old acquaintance, who embraced him, spread furs for him to sit on, placed before him some boiled beans and venison, and mixed some rum and water for his drink. When he was well refreshed, and had lit his pipe, Canesdego began to converse with him, asked how he had fared the many years since they had seen each other, whence he then came, what occasioned the journey, &c. &c. Conrad answered all his questions, and when the discourse began to flag the Indian to continue it, said: "Conrad, you have lived long among the white people, and know something of their cus-

toms. I have been sometimes at Albany, and have observed that once in seven days they shut up their shops, and assemble all in the great house; tell me, what is it for? What do they do there?" "They meet there," says Conrad, "to hear and learn good things." "I do not doubt," says the Indian, "that they tell you so: they have told me the same: but I doubt the truth of what they say; and I will tell you my reasons. I went lately to Albany to sell my skins, and buy blankets, knives, powder, rum, &c. You know I used generally to deal with Hans Hanson; but I was a little inclined this time to try some other merchant; however, I called first upon Hans, and asked him what he would give for beaver. He said, he could not give more than four shillings a pound; "but," says he, "I cannot talk on business now; this is the day when we meet together to learn good things; and I am going to the meeting." So I thought to myself, since we cannot do any business to day, I may as well go to the meeting too, and I went with him. There stood up a man in black, and began to talk to the people very angrily. I did not understand what he said; but, perceiving that he looked much at me and at Hanson, I imagined he was angry at seeing me there; so I went out, sat down near the house, struck fire, and lit my pipe; waiting till the meeting should break up. I thought too, that the man had mentioned something of beaver; and I suspected it might be the subject of their meeting. So, when they came out, I accosted my merchant. "Well, Hans," says I, "I hope you have agreed to give more than four shillings a pound." "No," says he, "I cannot give so much: I cannot

give more than three shillings and six-pence." I then spoke to several other dealers; but they all sung the same song, three and six-pence, three and six-pence. This made it clear to me, that my suspicion was right; and that, whatever they pretended, of meeting to learn good things, the real purpose was, to consult how to cheat Indians in the price of beaver. Consider but a little, Conrad, and you must be of my opinion. If they meet so often to learn good things, they would certainly have learnt some before this time. But they are still ignorant. You know our practice. If a white man, in travelling through our country, enters one of our cabins, we all treat him as I treat you; we dry him if he be wet, we warm him if he be cold, we give him meat and drink, that he may allay his thirst and hunger, and spread soft furs for him to rest and sleep on: we demand nothing in return.* But if you go into a white man's house at Albany, and ask for victuals and drink, they say, "Where is your money?" and if I have none, they say, get out you Indian dog! You see they have not yet learnt those little good things that we need no meetings to be instructed in, because our mothers taught them to us when we were children. And therefore it is impossible that their meetings should be for any such purpose as they say,

* It is remarkable, that in all ages and countries, hospitality has been allowed as the virtue of those whom the civilised were pleased to call barbarians. The Greeks celebrated the Scythians for it. The Saracens possessed it eminently; and it is to this day the reigning virtue of the wild Arabs. St Paul, too, in the relation of his voyage and shipwreck on the island of Melita, says, *The barbarous people shewed us no little kindness: for they kindled a fire, and received us every one, because of the present rain, and because of the cold.*

or have any such effect. They are only to contrive the cheating of Indians in the price of beaver.

Farther Remarks on Filamentous Plants.

[As a continuation of those of Dr. Anderson in our last, page 233.]

DR. ANDERSON has pointed out in the sketch referred to a most useful line of inquiry, which, if prosecuted, cannot fail to be attended with consequences highly beneficial alike for India and for Britain. Hitherto we have contented ourselves with the filaments obtained from two plants only, the *cannabis sativa*, or common hemp, and flax, *linum usitatissimum*, for the purpose of cordage and many other useful fabrics, without investigating the properties of the fibres that may be obtained from an immense variety of other plants, which will probably be found to possess qualities that render them much fitter for some particular uses than these are. I had occasion to point out (page 149) a peculiar excellence of the fibre of the common nettle, *urtica urens*, which, for some purposes, renders it much more valuable than hemp or flax; and other filaments may possess other qualities equally valuable that we do not at present suspect. This is therefore a fine field for observation and useful experiment.

Among the plants enumerated by Dr. Anderson, the only one that has been actually used for cordage in practice, in as far as I yet know, is the husk of the cocoa nut, which has been used in India for that purpose for coarse ropes for many years. These are called there *coire* ropes, of which the cables for country ves-

sels are usually made. These, though less polished to appearance than hempen ropes, are found to last much longer, and, possessing a certain degree of elasticity, vessels are found to ride much easier by such cables in a hard gale than with hempen cables. If the experiment of Mr. Webb with the filaments of the great aloe shall succeed, as they expect, it must be a most valuable discovery.

Independant of the *quality* of the fibres of those plants that are enumerated, and others that may be employed for the same purposes, we may expect that many of them will become valuable merely on account of the economy that will result from the using of them. Some years ago a few seeds of a particular kind of hemp, which might be called *cannabis gigantea*, was brought into this country from China, which, being sowed here, grew to the height of twelve feet; but the seeds of it did not ripen in this climate; though it appears, by a letter from Dr. Lettsom (M. R. for April last) that the seeds have ripened, and the plant thrives in Virginia, and also that it has succeeded in France. There can be no doubt but it might be easily propagated in many of our settlements in India, and with much benefit to the natives who there so much abound.

I have just now in my possession a small quantity of the drest fibres of a kind of hemp, as it was called, which came from some part on the west coast of the continent of South America, which measures no less than thirteen feet in length; but I have got no account of the plant that yielded it. These filaments are strong, but seem to me to be more rigid and less

pliable than our common hemp. They are remarkably clean and clear, and whiter than unbleached hemp of this country. I have no doubt but they could be dressed into as fine filaments as common hemp, were it judged necessary.

There is a kind of sea grass comes from India not thicker than a hair, which is sold by those who deal in angling tackle under the name, I think, of Indian weed, which, if stretched round two rollers, will bear a greater weight without breaking than perhaps any other filament of the same size yet known, not excepting silk; but when doubled short down, as when tied into a knot, it snaps there very easily. This substance, if properly spun into ropes at its whole length, promises to be both a cheap and a valuable acquisition; but I do not find that my friend Dr. Anderson has as yet been successful in his researches after this plant.

The other plants enumerated by Dr. Anderson above have every appearance of making most valuable additions to our *materia economica*, to adopt a new phrase, should he live long enough to complete his experiments upon them.

But there is still one other object of research to which I wish to direct the attention of the investigators of nature; it is to the discovery of such plants as can afford materials *directly* for the manufacture of paper, without having been used in any other fabric. These substances may be looked for chiefly under three classes: viz. 1st. the wings or natural envelopes of seeds similar to those of the cotton plant, the asclepias, and many other plants; these, in general, have been found to be too elastic, or too incoherent, to

answer in that fabrication by the processes hitherto adopted; probably improvements in that respect may be made. These substances possess one excellence that is more rare in the others, viz. the purity of their native white. 2d. The fibres of plants or bark of trees. The number of plants that could afford fibres fit for this purpose is innumerable, but few of these could be used without bleaching, and many of them, without some preparation, become so brittle when dry as not to be altogether proper for the purpose. The bark of the common osier is of that number, though it has been found to make very good wrapping paper. The inner bark of the Scotch elm is very tough, and of colour white enough for many purposes, could it be separated from the outer rind. This ought, therefore, to be the subject of experimental operations. The bark of the paper mulberry needs very little preparation, as appears by the innumerable specimens of Otaheitean cloth. I have seen a paper, also, that was made of an aquatic weed that would answer well for some purposes, though it had too little cohesiveness for common use. 3d. The fibres of the *wood* itself of certain trees. The number of trees of this description that may be found is much greater than is commonly suspected. In tropical climates the wood of most of the palm tribe consists of a congeries of tough fibres, inclosing loosely among them some parenchymetous parts, which probably might be separated by some easy process were it adverted to: nor would the natural meshing of these fibres prove any objection for this purpose, however much it might render it unfit for cordage. Even in this country there are several kinds

of wood having tough fibres that might be easily reduced to a mash fit for paper, particularly that of the bay-leaved willow (*Salix pentandria*) which is naturally of so pure a white as to require no preparation for that purpose, and which may be split with ease by basket-makers, and others who work in chip, to the fineness almost of a hair. It is wonderful that a substance, which in the manufactures above-named is so often exhibited so nearly in the state of paper, should never have been thought capable of being applied to that purpose. Nor is there any wood that could be reared in this country at less expense, or in greater quantities.

The Quirinal Garden, from Gorani.

THIS garden is very agreeable, and pleasantly laid out. There are very pretty poultry yards, where are fattened poultry and other delicate birds, in order that they may be worthy to be digested in the very holy stomach of the Holy Father. It lies to the south, which is very favourable for the health of the Popes, who are commonly of an age in which their own natural warmth is much diminished. There is a coffee-house there which Benedict the Fourteenth built for his interview with the king of Naples, who was afterwards king of Spain under the name of Charles the Third.

When this prince passed through Rome to take possession of the crown of the two Sicilies, Benedict the Fourteenth wished anxiously to have some conversation with him; but fearful lest the ceremonies

that are customary when Catholic kings have an audience of the Pope might be displeasing to the Neapolitan monarch, he thought of a good expedient. By his order a coffee-house was erected, in which the two sovereigns should meet as if by accident, and embrace each other as friends without any formality. Charles entered this pretty coffee-house, where he should have waited until the Pope came in also; but the moment he saw the Pope at the end of the alley he rushed out, and flung himself on his knees, though he was still at a considerable distance. Lambertini, who was a humourist, could not prevent himself from exclaiming *che cogliese!* (what does he pick up!) then turning to the cardinals who were attending him, said, "Let us return our thanks to God, and beseech of him that he would have the goodness to form all Catholic princes of the same paste with which this is made."

*Addendum to the Paper on Thermometers in this
Number, page 289.*

WHEN describing the air thermometer, page 282, I heedlessly forgot to advert that, as the bulb of an air thermometer of the simplest construction must be at the top of the tube, and the open end that is immersed in the bason, like that of a barometer, must be at the lower end, so that the liquor must rise in the tube with cold, and sink with heat, it would be impossible with a thermometer of this construction to indicate the heat below ground. To do this, all that is necessary is to bend the tube after it has risen to a proper height to admit of the necessary range, so as to make the bulb be lowest, taking care that

the descending tube be so much longer than the ascending leg, as to admit of its being sunk to the proper depth in the ground, while the bason is still left above ground, so as to be entirely open to view its whole length. Where the tube is so long, the bore ought to be very small, so as to bear a very small proportion to the bulb, otherwise its movements might be deranged by the temperature above ground.

A Query.

It will be obliging if any of my readers can inform me what is the insect, the larva of which is the maggot or grub, that feeds upon the young bulbs of onions, and effectually destroys them wherever they establish themselves. The maggot, when full grown, is about half an inch in length, of a white colour all over, unless the head, which is of a dark brown colour. It is lodged between the coats of the onion, on which it begins to prey as soon as it is hatched, when it is very small. Sometimes four or more are found in one of the bulbs, which soon discovers symptoms of being sickly, which becomes more apparent from day to day, till the plant dies entirely. This takes place in general before the bulb be entirely consumed, on which the grub continues to prey after the leaves are entirely withered.

Index Indicatorius.

A Hertfordshire Farmer controverts the opinion expressed in Mr. Culley's treatise on live stock, con-

cerning the superiority above all others of the Dishley breed of sheep, in respect to their aptitude to fatten; and contends that there are breeds of sheep in this island that are possessed of some qualities superior to them, and in their aptitude to fatten early, their equal. Time, he says, will prove this to those that now think otherwise. The Dishley breed, he admits, were calculated for the site of their selector (to whose merits he pays a tribute of just applause); but he denies that they are calculated for the fold. Mr. C. he adds, hints, p. 141, that the advantage of folding is doubtful; which opinion this correspondent warmly controverts, and would be glad, he says, to see the errors of the folding system pointed out in this miscellany, or any other publication; as he, looking at the universal practice of folding in some of the best counties in this island, accounts it highly beneficial.

T. R. B. wishes for several articles which, if given in those kind of short papers he recommends, would be totally unintelligible. The account of the universal character, for instance, cannot be given in a few pages, if it is meant to be of any use; and it is this consideration that has made it be postponed. Those who write merely to *amuse*, may adopt a plan very different from those whose object is to *inform*; nor is it compatible with a work of this kind to convey information on some subjects.

Philo's favour is received. His suggestion shall be properly attended to, and I hope things shall be so conducted as not to give him any cause of uneasiness. Perhaps if he were sometimes to look into the department which he says is uninteresting to him, he

may find some things that might engage his attention.

To *I. F.* the Editor can only say that it would give him much pleasure could he adopt every plan that should prove agreeable to any one of his readers; but, as that is impossible, he must do what he can to satisfy the majority. The objections to the plan he recommends were very numerous. He regrets it should be so.

Juvenis Indagator wishes that a translation (a poetical one I presume he means), were given of the beautiful Italian lines that were quoted by Julia in her first letter (Vol. I. M. page 38). If the Editor can have influence with the fair writer to confer that additional favour upon him, he will take it as a particular kindness; for he believes few persons are better qualified to do it justice. It would prove a high treat to many of my English readers also, could she be prevailed with to exhibit in an English dress some of the lyric pieces of Metastasio, which prove so enchanting to every one who reads them in the original, should she feel an inclination to do them *con amore*. It would be better still to outrival them.

The favour of *F. W.* ought to have been sooner acknowledged, had not other circumstances unavoidably postponed it. The little composition of this young writer might do very well in a letter to a friend like himself, whom it might serve to amuse; but the subject is rather of too little importance for this miscellany.

The valuable communication of *Hafex* is received, and shall be attended to; as also that of *Aristides* and *Leusippus*, which are under consideration.

17.

JULY 1800.

RECREATIONS

IN

AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 5. VOL. III.

AGRICULTURE.

PRACTICAL REMARKS ON THE MANAGEMENT
OF THE DAIRY, PARTICULARLY IN RESPECT
TO THE OBTAINING OF BUTTER.

[Continued from page 256.]

Part 5th. *General aphorisms respecting the management of milk in the dairy, for the purpose of obtaining butter.*

IN the management of a dairy, the following peculiarities respecting milk ought to be particularly adverted to: some of them are, no doubt, known in part to attentive dairy owners; but I have reason to believe

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that they have never yet been considered by any one with so much attention as their importance deserves; and by many persons, perhaps, have never been thought of at all. I adopt the form of aphorisms, that they may be the more readily adverted to, and the easier remembered.

FIRST APHORISM.

Of the milk that is drawn from any cow at one time, that part which comes off at the first is always thinner, and of a much worse quality for the purpose of making butter, than that which comes afterward; and the richness goes on continually increasing to the very last drop that can be drawn from the udder at that time.

Few persons in the country are ignorant that the milk which is taken from the cow last of all at one milking is richer than the rest of the milk; on which account a distinct name has been given to it in most parts of the country. In some places it is called *afterings*, because it is usually obtained, when it is wanted for sick persons or other uses, by re-milking the cow *after* the ordinary milking has been finished. —In other places it is called *stroakings*, because it does not come in so full a stream as in the ordinary course of milking; and it is, probably, known by other names in other parts of the country. This circumstance sufficiently proves, that the difference in its quality has been adverted to; but few, perhaps, are aware of the greatness of the disproportion between the quality of the first and the last drawn milk from the same cow at one milking. The following facts respecting this particular were ascertained by me many

years ago, and have been confirmed by numberless subsequent experiments and observations.

Having taken several large tea-cups exactly of the same size and shape, one of them was filled at the beginning of the milking of the cow, and the others at regular intervals till the last, which was filled with the dregs of the stroakings. A counter-weight being put in for each cup, they were individually weighed, so as to ascertain with precision that the same quantity of milk was contained in each cup. From a great number of experiments, frequently repeated with many different cows, the result was in all cases thus:

The quantity of cream obtained from the first drawn cup was, *in every case*, much smaller than from that which was last drawn; and those between afforded less or more as they were nearer the beginning or the end. It is unnecessary here to enter into the minute details of these intermediate proportions; but it is proper the reader should be informed, that the quantity of cream obtained from the last drawn cup, *from some cows*, exceeded that from the first in the proportion of *sixteen to one*. In other cows, however, and under particular circumstances, the disproportion was not quite so great; but in no case did I find it fall short of the ratio of *eight to one*. Probably, upon an average of a great many cows, it might be found to run at the ratio of *ten or twelve to one*.

The circumstance that chiefly occasioned a variation in regard to these proportions was, the nearness or distance from the time of calving; for, in all cases, the milk of the same cow was thinner immediately after calving, than at a greater distance from it; and

the disproportion between the first and the last drawn was also much greater soon after calving than at a more distant period. As the flush of milk occasioned by that incident abated, it became, in general, thicker and more uniform in its quality, so that if within a fortnight after calving the proportion of cream from the first and the last drawn cups were as *sixteen to one*, it is probable that at the end of six or nine months the disproportion in that cow's milk would not be more than as *ten or twelve to one*.

But these variations do not take place in the same proportion in every cow; on the contrary, the milk of some cows at all times varies more in this respect than that of others; so that in this case, as in most others, the nature of the breed, and the individual idiosyncrasy of the animal, must both be adverted to before any certain conclusions can be drawn.

But if the difference in the *quantity* of the cream obtained at the beginning and at the end of the milking be great, the variation in point of the *quality* of that cream is still greater. In the first drawn cup, especially when the difference in the quantity was very great, the cream upon it was only a thin tough film; thinner, and perhaps whiter than the paper on which I write; in the last drawn cup, it was of a thick butyraceous consistence, and of a glowing richness of colour that no other kind of cream is ever found to possess.

The difference in the quality of the *milk* that remained after the cream was separated, was perhaps still greater than what respects either the quantity or the quality of the cream. The milk in the first drawn

cup was a thin bluish liquid, appearing as if a very large proportion of water had been blended with ordinary milk; that in the last drawn cup was of a thick consistence, yellow colour, and rich taste, more resembling cream than milk in all respects, only sweeter to the taste, and less oily upon the palate.

From this experiment it appears, that the person who, by bad milking of his cows, loses a little milk, loses more than is usually suspected; for if he leaves behind only half a pint of milk that might have been obtained, he loses, in fact, as much cream as would have been yielded by about *six* or *eight* pints at the beginning, and loses, besides, that portion of the cream which alone can give richness and high flavour to his butter. Many other useful corollaries may be drawn from it, which I do not stop to enumerate; but some of them will occur in the sequel.

SECOND APHORISM.

If milk be put into a dish, and allowed to stand till it throws up cream, that portion of cream which rises first to the surface is richer in quality, and greater in quantity, than what rises in a second equal portion of time; and the cream that rises in the second interval of time is greater in quantity, and richer in quality, than what rises in a third equal space of time; and that of the third than the fourth, and so on; the cream that rises decreases in quantity, and declines in quality continually, as long as any rises to the surface.

My experiments in this case not having been made with so much accuracy as in the former, I have not been enabled to ascertain the difference in the proportion that takes place in equal portions of time: but they have been so often repeated as not to leave any

room to doubt the fact; and it will be allowed to be a fact of no small importance in the management of the dairy. It is not certain, however, but that a greater *quantity* of cream, upon the whole, may be obtained from the milk by taking it away at different times, but the process is so troublesome, as not to be counterbalanced by the increased quantity obtained, if indeed any additional quantity be thus obtained, which is not as yet fully ascertained.

But where the *quality* of the butter is the principal object aimed at, it may be greatly improved by duly attending to this peculiarity.

THIRD APHORISM.

Thick milk always throws up a much smaller proportion of the cream that it actually contains than milk that is thinner, but that cream is of a richer quality: and if water be added to that thick milk, it will afford a considerably greater quantity of cream, and consequently more butter, than it would have done if allowed to remain pure; but its quality is at the same time greatly debased.

This is a fact that every person attentive to a dairy must have remarked: but I have never heard of any experiment that could ascertain either the precise amount of the increased quantity of cream that might be thus obtained, or of the ratio in the decrease of its quality; but it ascertains, at least, the effect of mixing water with the milk in a dairy; and the knowledge of this fact will enable attentive persons to follow that practice which they shall find will best promote their own interest.

FOURTH APHORISM.

Milk which is put into a bucket, or other proper vessel, and carried in it to a considerable distance, so as to be much agitated, and in part cooled before it be put into the milk-pans to settle for cream, never throws up either so much or so rich cream, as if the same milk had been put into the milk-pans directly after it was milked.

In this case, it is believed, the loss of cream will be nearly in proportion to the time that has elapsed, and the agitation it has sustained after it has been drawn from the cow: but I am not as yet in possession of any experiments that sufficiently ascertain *how much* is to be ascribed to the time and the agitation taken separately. On every branch of agriculture we find that experiments are wanting at each step that we advance in our inquiries. The labours of no one man, nor indeed of a considerable body of men, who were to devote the whole of their time and attention to these pursuits, could complete the whole: but it is the duty of every inquirer to point out, as he goes along, where they are wanted; that thus the attention of those who have leisure and inclination for such pursuits may be directed towards proper objects.

From these fundamental facts respecting the dairy, many very important corollaries serving to direct the practice may be deduced; among which we shall only stop to take notice of the following.

First, It is evidently of much importance, that the cows should be always milked as near to the dairy as possible, to prevent the necessity of carrying and cooling the milk before it be put into the dishes; and, as cows are much hurt by far driving, it must be a great

advantage in a dairy farm to have the principal grass fields as near to the dairy or homestead as possible. In this point of view also, the practice of feeding cows in the house rather than turning them out to pasture in the field, must appear to be obviously beneficial.

Second, The practice of putting the milk of all the cows of a large dairy into one vessel, as it is milked, there to remain till the whole milking be finished, before any part of it is put into the milk-pans, seems to be highly injudicious, not only on account of the loss that is sustained by agitation and cooling, but also, and more especially, because it prevents the owner of the dairy from distinguishing the good from the bad cow's milk, so as to enlighten his judgment respecting the profit that he may derive from each. Without this precaution, he may have the whole of his dairy-produce greatly debased by the milk of one bad cow, for years together, without being able to discover it, as I have already had occasion to illustrate, page 165. A better practice therefore would be, to have the milk drawn from each cow separately put into the creaming-pans as soon as milked, without being ever mixed with any other: and if these pans were all made of such a size as to be able to contain the whole of one cow's milk, each in a separate pan, so that the careful *dai* (an excellent provincial word denoting the person who has the chief concern in a dairy, without distinction of gender) would thus be able to remark, without trouble of any sort, the quantity of milk afforded by each cow every day, as well as the peculiar qualities of that cow's milk. And if the same cow's milk were always to be placed on the same part of the shelf, hav-

ing the name of the cow written beneath the stand, there never could be the smallest difficulty in ascertaining which of the cows it was the owner's interest to dispose of, and which of them he ought to keep and breed from.

Third. If it be intended to make butter of a *very fine quality*, it will be advisable, not only to reject entirely the milk of all those cows which yield cream of a bad quality, but also in every case to keep the milk that is first drawn from the cow at each milking entirely separate from that which is got last; as it is obvious, if this be not done, the quality of the butter must be greatly debased, without much augmenting its quantity. It is also obvious, that the quality of the butter will be improved in proportion to the smallness of the proportion of the last drawn milk that is retained; so that those who wish to be singularly nice in this respect, will do well to retain a *very small* proportion only of the last drawn milk.

To those owners of dairies who have profit only in view, it must be ever a matter of trial and calculation, how far it will be expedient in them to carry the improvement of the quality of their butter, at the expence of diminishing its quantity. In different situations, prudence will point out different kinds of practice as most eligible; and all persons must be left, after making accurate trials, to determine each for himself. It is likewise a matter of some importance, to determine in what way the inferior milk that is thus set apart, where fine butter is wanted, can be employed with the greatest profit. In the highlands of Scotland the people have adopted a practice, merely from considera-

tions of convenience and economy, without thinking of the improvement of the butter, which answers many good purposes. As the rearing of calves is there a principal object with the farmer, every cow is allowed to suckle her own calf with a portion of her milk, the remainder only being employed for the purposes of the dairy. To give the calf the proportion allotted to it regularly, it is separated from the cow, and put into a small inclosure made for that express purpose on every farm, along with all the other calves belonging to that farm. At regular times, all the cows are brought to the door of this small inclosure, where the young ones fail not to meet them. Each calf is then separately let out, and runs directly to its mother, where it is allowed to suck till the dairy-maid judges that it has had enough, when she orders it to be driven away, having previously shackled the hinder legs of the mother, by a very simple contrivance, to oblige her to stand till. Boys, who attend for that purpose, drive away the calf with switches, and return it into the inclosure, while the dairy maid milks off what was left by the calf. They proceed in this manner until the whole of the cows are milked; and thus do they obtain a small quantity of milk, it is true, but that milk is of an exceeding rich quality; which, in the hands of such of the natives as know how to manage it, is manufactured into the richest marrowy butter that can be any where met with. This richness of the Highland butter has been long remarked, and has been very universally ascribed to the old grafs that the cows feed upon in those remote glens; but it is in fact chiefly to be attributed to the practice here described,

which has long prevailed in those districts. Whether a similar practice could be economically adopted elsewhere, I do not take upon me to say; but, doubtless, other secondary uses might be found for the milk of inferior quality. On some occasions, it might be converted into butter of a secondary quality; on others, it might be sold sweet, where the situation of the farm is within reach of a town; and in other situations it might be converted into cheeses, which, by being made of sweet milk, if made with care and skill, might be of a very fine quality. Other uses still might be devised for the application of this milk, which I cannot now stop to enumerate.

Although I do not mean in this essay to enter professedly on the dairy management for the purpose of making cheeses, it is necessary, for the purpose here stated, and other considerations that will soon occur, to suggest a few hints on that head, so nearly connected with the object of our present discussion. It will be found, when it comes to be investigated, that the reasoning usually adopted on this subject is in many respects erroneous. It is, for example, very generally supposed, that the goodness of cheese depends almost entirely upon its *richness*; by which is meant, the proportion of oily matter, whether natural or adventitious, that it contains; nothing, however, is more certain, than that this is not the case. If the *sapor*, the pleasant relish to the taste, be adopted as the rule for ascertaining excellence, nothing can be more certain, than that this does not depend upon this circumstance. Parmesan cheese is in general deemed, in respect to *sapor*, among the best kinds of cheese that are made;

but it contains no remarkable proportion of oily matter. To many palates, the small round Dutch cheeses are very pleasing to the taste, yet these are made entirely of skimmed milk.

If softness to the feel, and that kind of consistency which appears mellow and butyraceous, be the rule for ascertaining the *richness* of cheese, neither will this be found to depend necessarily upon the proportion of oily matter that they contain. I have seen cheeses made of skimmed milk, that ate exactly like the finest kind of cream cheese, which approaches to the taste and consistency of butter; and I have seen cheeses made entirely of cream, which had much less of that buttery taste and appearance than the other. In short, much more depends upon the skill and dexterity of the operator, than on the quality of the materials. Many cheeses are made in England of as rich milk as the Stilton cheeses, which seem not to contain nearly the same proportion of cream; and I had lately occasion to notice, that a great many cheeses are made of the same kind of milk with the Suffolk cheeses, which have nothing of that horny hardness and indigestible quality, for which these are remarkable.

If the taste and consistence that the cheese acquires when acted on by heat in the process of toasting be assumed as a criterion for judging of its richness, neither will it be found that this depends upon the proportion of cream that enters into their composition. I have seen very indifferent cheese that has been made of skimmed milk, which when toasted was richer to the taste, and more soft in consistence, than Stilton cheese. And I have at this moment in my house a

round Dutch skim-milk cheese, that when toasted appears richer and more pleasing to the palate of most persons who have tasted it, than very excellent North Wiltshire cheese, which is deemed among the best kinds that are made in this island.

From these facts, and many other considerations, I am satisfied, that what we call the richness of cheese depends more upon the particular process adopted in the management, than upon the materials of which the cheeses consist. The taste of Gloucester and that of Cheshire cheeses are very different from each other, though the quality of the milk of which they are made varies very little. The same thing may be said of Stilton and Parmezan cheeses, though the vanity of man, desirous to conceal his own weakness, is for ever disposed to attribute these peculiarities to soil, or pasture, or other circumstances that seem to throw the blame of want of success from off his own shoulders. It is even so with regard to butter also, the excellence of which, in every district where fine butter is made, is universally attributed to the richness of the pastures, though it is a fact well known, that take a skilful dairy maid from that district into another where no good butter is usually made, and where, of course, the pastures are deemed very unfavourable, she will make butter as good as she used to do; and bring one from this last district unto the other, and she will find that she cannot make better butter there than she did before, unless she takes lessons from the servants or others whom she finds there. I have frequently known instances of this kind. The same thing takes place in the manufacture of beer. From the very

same malt put into the hands of a dozen of brewers in different districts, you shall have as many kinds of beer, totally distinct from each other; and, perhaps, no verbal instructions could enable one of these persons at the first to make, of that malt, beer of a similar sort to that of the other. In matters of this sort, a very great diversity is produced by circumstances apparently of the most trivial kind.

Respecting the management of milk for the obtaining of cheese, I beg leave farther to suggest the following particular, as a proper object of inquiry and experiment, viz. whether the quantity of caseous matter afforded by milk be necessarily connected with the proportion of cream which that milk contains, or whether it depends upon some other principle not hitherto investigated? Without pretending to decide on this question, I feel myself strongly inclined to believe, that it does *not* depend upon the quantity of cream. It is well known, that cow's milk, which always throws up more cream, and that of a much richer quality than ewe's milk, and still more so than goat's milk, does in no case afford half the proportion of cheese that either ewe's or goat's milk affords. Nor can this singular tendency of ewe milk to yield a great proportion of curd be attributed to its superior thickness; for the milk of particular cows may sometimes be had, that is thicker and richer than ewe milk; but it always affords a much smaller proportion of curd. It is also well known, that skimmed milk yields nearly, if not entirely, as much cheese as the same quantity of the same cow's milk does when the cream has not been separated from it. In short

cream, or the oily portion of the milk, seems not to be convertible into curd at all; a portion of it only is entangled among the curd, while another portion of it is carried off with the serum, or whey, from which it may be afterwards recovered in the form of butter, as is well known in many countries by the name of whey-butter. That butter is indeed of a quality much inferior to butter obtained from cream, but this may be occasioned by the particular circumstances in the process for making cheese; and it is by no means impossible, that by attending to the process with a view to this particular, the quality of that whey-butter might be much improved. In short, it appears probable to me, that the *caseous* and *butyraceous* parts of the milk are totally distinct from each other, and may be obtained separately, without much affecting the *quantity* of each, or even perhaps the *qualities* of either, were the dairy process sufficiently understood. On the whole, these considerations induce me to suspect, that it might be found, upon a careful investigation, that the refuse milk, which ought to be separated from the other, in making the best butter, would be equally proper, or very nearly so, for the making of cheese, as if no such separation had taken place.—I therefore recommended this as a very proper object of inquiry; but trust that the reader will carefully discriminate between these *suggestions* grounded on probability only, and the *directions* that are grounded on well authenticated facts.

Fourth. If the *quality* of the butter be the principal object attended to, it will be necessary not only to separate the first from the last drawn milk, but

also to take nothing but the cream that is *first* separated from the best milk; as it is this first rising cream that is of the prime quality. The remainder of the milk, which will be still sweet, may be either employed for the purpose of making sweet-milk cheeses, or may be allowed to stand to throw up cream for making butter of an inferior quality, as circumstances may direct.

Fifth. From the above facts we are enabled to perceive, that butter of the very *finest* quality can only be obtained from a dairy of considerable extent, when judiciously managed; for, when only a very small proportion of each cow's milk can be set apart for throwing up cream, and when only a very small proportion of that cream can be reserved as of the prime quality, it follows, that unless the quantity of milk were, upon the whole, very considerable, the quantity of *prime* cream produced would be so small as to be scarcely worth the while for manufacturing separately.

Sixth. From these premises, we are led to draw a conclusion extremely different from the opinion that is commonly entertained on this subject, viz. that it seems probable, that the very best butter could only be, with economy, made in those dairies where the making of cheese is the principal object. The reasons are obvious: — If only a small portion of the milk ought to be set apart for butter, all the rest may be made into cheese while the milk is yet warm from the cow, and perfectly sweet; and if only that portion of cream which rises during the first three or four hours after milking is to be reserved for butter, the *rich* milk

which is left after that cream is separated, being still nearly quite sweet, may be converted into cheese with as great advantage nearly as the newly drawn milk itself.

Nor does what I here observe tend to invalidate the justness of the commonly received opinion upon this subject, which will in general be just, according to the usual practice of dairy owners in any part of Britain; under whose system of management the making of good butter and good cheese in the same dairy is impracticable. For, where the whole milk is set apart for separating cream, and the whole of the cream is separated, the milk must of necessity be turned sour before it is made into cheese; and I believe that no best cheese can be made from milk that has once attained that state.

It is not, I believe, generally known, that the spontaneous separation of cream and the production of butter is never effected but in consequence of the production of acid in the milk; and the formation of that acid is accelerated by the separation of fixed air, or, as it is now called, carbonic acid air, from the milk, which is accelerated or retarded by circumstances not usually adverted to. This fact I had occasion to discover during a course of experiments on milk that I made a great many years ago, and that I have above alluded to; which was occasioned by the following circumstances.

Having remarked, that of two tea-cups, which contained milk that I knew to be of the same quality by previous experiments, one had the cream upon it at one time of a consistence different from the other;

and being at a loss to account for this variation, I tasted the milk in each of the tea-cups, and found one of them sensibly more acid than the other. A bit of newly slaked lime having been accidentally nearer to one of the cups than to the other, I began to suspect, that it might be occasioned by this circumstance. With a view to ascertain this fact, I instantly caused two tea-cups to be filled with equal quantities of the same milk, and immersed one of the tea cups up to the brim in a quantity of quicklime that had been so long slaked as to have acquired the same temperature with the air, but was not yet become nearly effete; the other tea-cup was placed in the same apartment, at the distance of about a yard from the former. The result was, that in the course of twelve hours the milk in the tea-cup placed among the lime tasted so sensibly sourer than the other, that of near a dozen of persons who were desired to taste them, without knowing for what purpose, every one of them pronounced it incontestibly the sourest. The cream also was more perfectly separated from it than the other.

I did not repeat the converse of this experiment, not having had conveniencies at the time for the purpose; but I have not a doubt, that were milk placed in a vessel filled with mephitic air, the acidification of the milk would be retarded, and the separation of the cream of course postponed. But be this as it may, it is a certain fact, that neither cream nor butter can be obtained from milk, till some portion of acid be produced in it. It is in consequence of this, that when fanciful people attempt to churn milk newly drawn

from the cow, the operation must be continued until this acid be generated, and of course the churning must be protracted much longer than would have been necessary under other circumstances, and this always tends to impair the quality of the butter. Now, as nothing tends so much to deteriorate the quality of cheese, as acidity in the milk from which it is made, it must follow, that when cream is separated from it *in the usual way* for making butter, the milk must have attained such a degree of acidity as to prove highly detrimental. It must, therefore, be a destructive practice to make butter in a cheese dairy after the usual manner; but not so in regard to the practice above recommended.

But, as it is not probable that many persons could be found who would be willing to purchase the very finest butter made in the manner above pointed out at such a price as to indemnify an ordinary dairy owner who should take so extraordinary a method to recommend himself to public notice, for his trouble in making it, these hints are thrown out merely to satisfy the curious in what way butter posseßing that superior degree of excellence may be obtained, if they choose to be at the trouble of doing it: but for an ordinary market I am satisfied, from experience and attentive observation, that if, in general, about half the milk be separated at each milking, and the remainder only be set up for producing cream, and if that milk be allowed to stand to throw up the whole of its cream, even till the milk tastes perceptibly sourish, and if that cream be afterwards carefully managed, the butter thus obtained will be of a quality

greatly superior to what can be usually obtained at market, and its quantity not considerably less than if the whole of the milk had been set apart for producing cream. This, therefore, is the practice that I should recommend, as most likely to suit the frugal farmer; as his butter, though of a superior quality, could be afforded at a price that would always insure it a rapid sale.

Another advantage would result from this practice, which might in some cases prove highly beneficial; for thus, it is probable, might some particular tastes of milk, that at times affect it and greatly deteriorate the butter, be entirely got rid of, as will appear from the following experiment.

In the course of the set of experiments on milk above alluded to, I perceived, that the milk from one cow tasted exactly as if salt had been put into it. Upon inquiry respecting the cause of this peculiarity, I was informed, that the cow in question had misfed calf that season, and was still continued in milk over the whole year; and I was farther told, that a salt taste was very frequently perceptible in milk of this kind. Having tasted some of the last drawn milk however, I found it was perfectly sweet, and that the milk of the first drawn cup was excessively salt. This particular strongly roused my attention; and, with a view to discover how much of the milk was affected with that salt taste, I caused the whole of the milk to be drawn from the cow into tea-cups one after the other; and, having examined them in the order they were drawn, I found that the first cup was the saltiest of any, and that this taste gradually abated in each succeeding

cup till about the middle, where it totally disappeared. It is probable, that the nauseous taste from cabbages, turnips, garlic, &c. may affect the milk after the same manner; but other avocations prevented me from bringing it to the test of experiment.

Before I leave this branch of my subject, I shall just beg leave to notice, that the spontaneous separations of milk, and the circumstances that may affect them, do not seem as yet to have ever been sufficiently adverted to, and of course are not understood; I shall therefore, I hope, be excused for throwing out a few suggestions tending to lead to useful investigations on this important branch of rural economy.

Milk seems to consist of four principal ingredients, viz. first, an oily matter, which may be separated in the form of cream or butter;

Second, a caseous matter, which may be separated in the form of curd and cheese;

Third, a saccharine matter, which has never yet been exhibited in its concrete state, because of the rapidity with which, in its diluted state, it always rushes forward into the acetous fermentation: and,

Fourth, a serous or watery part, which, probably, is nothing else than pure water impregnated with some of the other ingredients. This is separated in the form of whey, and a thin, almost colourless liquor obtained from sour milk.

Part of the saccharine matter seems to be entangled in, and carried off with the cream; and a part of it also is in like manner entangled in, and carried off in the curd, and, no doubt, contributes considerably to the sapor or flavour both of butter and cheese: but by

far the greatest proportion of that saccharine matter is always carried off in the serum, with which it is evidently more intimately blended than with any of the other ingredients.

This saccharine part never is so clearly developed as in whey, where that has been obtained from milk, into which the rennet had been put immediately as it was drawn from the cow. For, in this case, the time that has elapsed before it can be separated from the curd is so short, that it has scarcely run into the acetous fermentation at all; and the fluid is then so fully impregnated with sugar, as to taste extremely sweet; and there can be no doubt, that it might be applied to some very useful purposes in economy and arts, did we know sufficiently well how to retard the fermentation before it gets into the acetous state. The only mode adopted in this country to retard this process is, to boil the whey as soon as it is separated from the curd; a practice adopted on many occasions with considerable advantage; for it is a fact well known, that boiled whey will be as sweet after having been kept twelve hours, as the same whey unboiled would be in two hours.

The savages however, as we are pleased to call the Russian Tartars, have outrun us in this respect; and, by a process that has never been so well described as to be sufficiently understood by us, they obtain a nourishing fermented liquor still in its vinous state, which they call *kemiss*, which is capable of intoxicating those who drink it, like beer; and affords a vinous spirit by distillation. The natives of the island of Iceland also make from whey a vinous intoxicating

liquor, which they call *sira*, that is esteemed a great delicacy by them.

With us the saccharine part is in a great measure lost as a nutritious substance, both in whey and buttermilk, in consequence of its being allowed to run too far into the acetous fermentation before it be used. In the making of butter, this, as I have showed, is a necessary consequence to a certain degree, because the butter cannot be separated before that acidity prevails; but even when first separated, much of it still retains its saccharine quality; and could it be thus arrested, it must prove a food highly nutritious to animals of every sort. I beg leave therefore to recommend this, as a proper object for experiment and elucidation, to such of my readers as take pleasure in philosophical researches. The liquor is too thin to admit of retarding the fermentation by the process of *inspissation*. Boiling, in this as in every other case, only retards the rapidity of the fermentation a little. Perhaps some good might be obtained by neutralising the acid, so as to prevent it in the first place from operating as a leaven (I have no other word); and if that neutralised product could be made of a nutritious quality, or at least not in any respect noxious, some good would thus be gained.

From the experiment above stated it appears, that during the process of fermentation of milk, as of malt and other vegetable substances when properly diluted with water, a portion of fixed air is evolved from it, and the acidification of milk is accelerated by any circumstance that promotes that evolution of air; of course, it ought to be retarded by any circumstance

that retards the emission of air, exactly as happens in every process of fermenting liquors. It is upon this principle that we are to account for the necessity of bunging up fermenting liquors quite close after the fermentation has been carried so far as to have assimilated a portion of the saccharine matter into a vinous state; for, if this were omitted, the vinous fermentation would be soon finished, and the acetous fermentation would begin before the vinous process had been properly completed. By bunging up the liquor close when in this state, the vinous process is checked. The fixed air that is evolved, not being at liberty to fly off, acts upon the liquor strongly, and the vinous process goes on so slowly, that the liquor may in most cases be kept for years before the acetous fermentation begins, during all which time the vinous process is going forward: in this way, and in this way only, can fermented liquors ever be made to attain the highest degree of perfection of which they are susceptible.

The vinous process of milk then (for that it can be converted into a vinous liquor is undeniable) can only, in my opinion, be perfected by a process of the same sort. The difficulty seems to be, that the process is too rapid, exactly as is the case with the fermentation of malt liquors in warm climates, in which good malt liquor cannot be made. Nothing seems to be so likely to retard this process in milk, as to cool it as quickly after it is drawn from the cow as possible; for that natural heat pushes its fermentation rapidly forward at the beginning. For an experiment: let a small portion of milk, as soon as it is drawn, be put into a

bottle, and that bottle instantly immersed in water cooled to the freezing point, by having some pieces of ice dissolving in it. When it has remained there so long as to have acquired the temperature of the water, let it be taken out, and instantly corked as close as possible, fixing the cork down with a wire, and then dipping the whole of the cork, and part of the neck of the bottle into melted wax, so as totally to exclude access to the air; and then putting the bottle into a cool cellar, let it stand there for a considerable time, to observe the result. I should advise, that not less than a dozen of bottles should be treated thus for the first experiment, one of which should be opened at the end of each month till the whole be finished. I apprehend the result would be, that the milk would continue sweet, with no separation of cream, for a considerable length of time; that, by degrees, it would acquire a vinous taint and brisk sharpness like some fermented liquor, which would gradually acquire an acid taint: probably this last would sooner become perceptible than in vegetable saccharine vinous liquors; but it would be more pleasing and less hurtful to the stomach than these are. If so, it must become a liquor extremely palatable and nutritious. The process of making sira in Iceland, if I mistake not, is somewhat of the same sort as that which I here recommend; and Dr. Thorkelin, when in this country, spoke of that liquor with the most rapturous eulogiums.

Could the serous part of the milk alone be obtained as sweet as the whole when it comes from the cow, I should have no doubt of the result of the above process

being as there stated. But what effect might be produced upon the caseous and oily parts of the milk, which evidently are not so liable to acquire a sour taint as the other, I shall not pretend to say.

Could a kind of rennet be discovered that conveyed no salt taint to the milk, there seems little reason to doubt, that whey made as soon as possible after it comes from the cow, and cooled as soon as it was separated from the curd, and treated exactly as recommended above for the milk, would afford a pleasing subacid vinous liquor.

By a process much the reverse of that above described, the inhabitants of Mid Lothian, in the neighbourhood of Edinburgh, make a preparation of milk, that I believe is scarcely known any where else, which affords a pleasing and nutrititious article of food. It is there known by the name of *Corstorphin cream*, from a village of that name, where I presume it was first made. It is hawked daily through the streets of that metropolis by the name of *sweet-cream*. The process is as follows:

Take skimmed milk that has only acquired a moderately acid taste; put it in an upright wooden vessel (an upright churn is commonly used) having a spicket and fofset at the bottom; place that in a tub of a size sufficient to hold it; pour hot water into the tub till it rises nearly as high as the milk in the containing vessel. Cover the whole with a cloth, to keep in the heat. In a few hours the milk separates into two parts; the upper part assuming the consistence of thick cream that has very much the taste and appearance of good cream, only moderately acid; the other por-

tion that remains below is a thin watery liquid, which is of a pungent acid taste, and may be easily let off by means of the spicket; this liquid is then called *wigg*. The cream is then fit for use. I have said above, that by a certain process skim-milk cheese may be made to assume the taste and consistence of cream-cheeses; but I know no preparation of milk that would be so deceptive as this which I now mention; for no person could believe that it did not consist wholly of real cream that had been let stand till it became acid. Much of the goodness of this, however, depends upon the skill of the maker; as it is greatly affected by various circumstances, particularly the degree of heat to which it is subjected, and the acidity of the milk. It is eaten with sugar as a great delicacy. I have been told, that in Germany, where milk is a more favourite diet than in England, they make a great many elegant preparations from it.

[*To be continued.*]

N. B. To such of my readers as may be inclined to think that the agricultural department of this number exceeds its just proportion, I beg leave to remark, that this extra matter belongs more properly to the class of general physics than agriculture, and that it would of course have been placed rather under the third, or miscellaneous department of this work, had it not been judged more proper not to separate it from the agriculture on account of the connexion.

NATURAL HISTORY.

ON THE TRANSFORMATION, &c. OF INSECTS.

[Continued from page 265.]

The Earwig.

To the Editor of Recreations in Agriculture, &c.

SIR,

THE flattering attention paid to my first little essay has emboldened me to trouble you again with a few thoughts that have occurred to me in my favourite pursuit, the study of Entomology; and I am induced to do it, rather from a hope that a few imperfect hints may excite more able observers to finish the subjects, than from a vain idea that any superficial knowledge of my own should prove useful to the public. The Swedes, the French, and the Germans, have far outstripped us in this path of knowledge; not that I think they have more intrinsic information on the subject than my own countrymen; but they appear less diffident, and more eager to communicate their discoveries. Few indeed are the writers on the history, economy, and various transformations of insects, the principal works being generally confined to system and classification, which, although extremely useful in their way, have yet been too much multiplied of late, while the more essential part, the attention to their habits and mode of living, has been almost totally neglected. To attend insects minutely from their first bursting from the egg, and follow them through their several metamorphoses until they arrive at maturity or complete their perfect state, is not only

an arduous, but in many cases an impracticable task; and therefore some of our most common insects are totally unknown in their primary or larva state. The *Musca domestica*, or common house fly, is a singular instance of this; for very few are acquainted with that animal in its larva state, or even know on what it feeds, or what situations it inhabits; and yet the fly itself towards autumn becomes a pest in most houses. The *Cinex lectularius*, or bed bug, that loathsome, and yet common inhabitant of great cities, is known by experience to propagate and increase beyond all bounds, if not frequently sought after and killed, so that a bug-destroyer is become a trade of some consequence, and ranks at least with the rat-catcher, and other destroyers of vermin; but common as this insect is, and tormenting to many thousands of people, not one in a thousand, I will venture to say, knows any thing of its habits and changes, or can distinguish between the larva, the pupa, and the perfect insect. As a noxious animal the discrimination is unnecessary, and therefore may be considered merely as a matter of curiosity rather than of use; although it is probable, that what may be poisonous to the larva will have no effect on the perfect insect, and vice versa. Another very common and destructive insect, and which I propose to treat of in this essay, is the *Forficula auricularia*, of the scientific authors, by the French called *Le Perce Oreille*, by the Swedes *Oremask*, which signifies the worm of the ear, and by the English *earwig*. The form of this insect, added to a mistaken idea respecting it, which I shall mention in the sequel, may be a principal cause of its being so little attended to,

and yet we have few insects more deserving attention. I presume many of your readers will be much surprised to find that the earwig is furnished with wings, that those wings are large and beautiful, and that one of them when extended would nearly cover the whole insect; but such is the fact, and the insect may frequently be taken on the wing at certain seasons of the year. I shall endeavour to condense what has been said by other authors, and add some few observations of my own respecting this insect, being very anxious to induce some intelligent person who lives in the country to pursue the subject.

The insects of this genus are well distinguished by the pincers or forceps which they bear at the end of their abdomens, and from which the name of *Forficula* has been given to them. The remarkable name of *Perce Oreille*, or, as we call it, *earwig*, originated from an idea that it introduced itself into the ears, and from thence penetrates to the brain, and occasions death. But M. Geoffrey justly observes that those who are acquainted with anatomy know the impossibility of such an introduction into the skull, because there is no opening which communicates with it; and that author is of opinion that the fright of some person, who by chance had one of these insects in his ear, had given rise to this vulgar error. I am inclined to think, however, that there has been some more satisfactory reason, which is at present lost; since it bears a similar name in three different countries, and in three different languages. With respect to the pincers which the earwig carries at its tail, and with which it appears willing to defend itself, the same au-

thor observes, that they are not so formidable as they appear to be at first sight, not being of sufficient strength to produce the least sensible impression. He knew not whether the animal makes use of them to defend itself from other insects, but he had often seen it in the midst of an ant hill seeking to fly, without attempting to use the pincers against the ants. The celebrated Swedish naturalist De Geer has pursued this subject much further; and, with his usual accuracy and penetration, has given so curious and interesting an account of the earwig, proving its history to differ from that of every other insect with which we are acquainted, that I trust a compendium of it will be acceptable to your readers. He observes that these insects are well known, but particularly to gardeners, who have often reason to complain of them for the damage they do to wall-fruit, as peaches, nectarines, and apricots, which they are very fond of.

The earwig breaks from the egg with nearly the same figure that it always preserves, but with the exception of the wings, which are produced afterwards. It is most commonly found in the earth under stones and under the bark of half decayed trees. It feeds on various substances, but it is principally fond of fruit.

The wings and elytra, or wing cases, being by far the most curious and least known part of this insect, I shall insert the full description of them from De Geer. The two elytra are very short, and extend over but a small part of the body, that is to say, only the upper part of the breast. They form a long square, the posterior part being truncated or cut off at right

angles, but a little concave. At first sight they seem to have one articulation nearly at the extremity, and appear terminated by an oval part ornamented with a dirty white and yellow spot; but on loosening them from the body, we see that this oval part with the spot is a portion of the wing itself, which projects from under the elytra, and is not concealed by it. When the insect displays its wings, they extend almost to the end of the abdomen, but when inactive they are folded in a little packet, and brought back under the elytra in a very marvellous manner. In unfolding the wing one is astonished at its extent and size, and can scarcely comprehend how it can find a place under a case of such small dimensions. By comparing together the two figures annexed of the elytra and wing, both of them delineated under the same lens, the disproportion in size is clearly perceptible.



The portions of the wing marked *a b c d e* are of a scaly substance, the rest is membranous, and extremely thin and transparent. The part *d* is that which appears from under the elytra, it forms the extremity of the packet when the wing is folded under its case. The membranous part of the wing, which is of an oval figure, is furnished with brown nerves very delicate, which proceed from the part *c*, and extend towards the circumference of the wing, so that they are arranged like the radii of a circle. Between these nerves there are others about half the length, which extend from the circumference to about the middle of the wing only. All these nerves are crossed near the circumference of the wing by another continued nerve, which takes the semicircular form of the wing, and serves to hold it well extended, as represented in the figure.

To place the wing under the elytra it is folded first lengthways like a fan; afterwards it is refolded in two different places in such manner that the folds form three portions which are applied one over the other. The first fold is made in the part *c*, which is the centre from whence the nerves proceed, as before mentioned; the wing is furnished as it were with an hinge. The other fold is produced near the middle of the membranous part, and near the extremity of the demi nerves, on which account the nerves have at that place the small scaly enlargements marked in the curved line *f g*, to enable them to sustain the folding. From this arrangement, and by means of the different folds, the wing is reduced to a packet of a small size, and proportioned to that of the elytra, under which it is to find a place.

The male earwig differs very little from the female, except that the pincers at the end of the abdomen are larger and stronger. At the beginning of the month of June De Geer found under a stone a female earwig, accompanied by many little insects, which evidently appeared to be young ones, of which she was the mother. They continued close to her without quitting her, and often placed themselves even under her belly, as chickens do under a hen. The insects of this genus, therefore, have in some sort the care of their young, and even after they are hatched they seem anxious to protect them by keeping near them. The little ones resemble their mother in figure, excepting that they have neither wings nor elytra, and the breast and thorax are not distinguishable; the body is long, but thicker in the middle than at the extremities; it is divided into thirteen rings, of which the three first answer to the thorax and breast, and to these rings the six feet are attached, one pair to each ring. The head has precisely the same figure as that of the perfect insect. He placed the little ones with their mother in a box, into which he had put a little fresh earth. They did not enter the earth, but it was curious to see how they thrust themselves under the belly and between the feet of the mother, who remained very quiet, and suffered them to continue there. She seemed then to cover them, as a hen covers her chickens, and they often remained in that position for hours. To feed them he gave them a piece of a pippin very ripe. In an instant the large earwig ran upon it, and ate it with a good appetite. The young ones seemed also to eat a little, but with much less relish. On the 8th of June he re-

marked that the young earwigs had moulted or changed their skins, and he found also the sloughs that they had quitted. This moulting had produced but a very slight change in their figure, but it brought them nearer to the perfect insect. At another time, about the beginning of April, he found a female earwig under some stones placed over a heap of eggs, of which she took all the care imaginable, without ever forsaking them; and this Mr. Frisch had observed before him. He took her with the eggs, and placed her in a box half filled with fresh earth, so that the eggs were dispersed here and there; but she soon removed them one after another, carrying them between her jaws, and, at the end of some days, he saw that she had collected them all into one place upon the surface of the earth, and remained constantly on the heap, without quitting it for a moment, so that she seemed truly to sit for the purpose of hatching her eggs. The eggs were white, smooth, pretty large, and of an oval figure, and the young ones were hatched the 13th of May. In figure they were similar to those before-mentioned, but at their birth they were all white; the eyes and the teeth were alone reddish, and towards the tail a yellow matter was observable through the skin. The most remarkable circumstance, however, was their size, which by no means corresponded with the bigness of the eggs from whence they were produced; for it appeared scarcely possible for them to be inclosed in so small a space, nor could he have believed it, if he had not seen them come out, so that they must have been much compressed. The body of these little animals appeared much swelled, and the beating

of the heart, or of the grand artery placed along the back, was very perceptible through the transparent skin.

He kept them in the box with their mother, feeding them with bits of apple from time to time, and saw them grow every day, and change their skins more than once; but he neglected to notice the exact number of times they moulted before they arrived at a state of perfection. The number of young ones, however, daily decreased, and the mother having died, he found her mangled and half eaten, which could only have been done by her own progeny. The little ones which had disappeared, without doubt, shared the same fate; but he had reason to think it was for want of other food, for he had neglected to supply them regularly. He never saw them attack each other while living, but it is certain that those which died were eaten by the others. On the 23d of July one only remained alive; it was full grown, and then in the nymph or pupa state.—To so curious and interesting a narrative there is little left to add; I shall therefore only remark, that the destructive properties of this insect are not confined to fruit, but that it also destroys, in great quantity, young and tender plants. In the month of August, 1794, I planted out some cos-lettuces from the seed-bed; they were very small, but I was surprised, three days afterwards, when it was evident they had taken root, to find them much eaten; and being desirous to preserve them, I searched with unremitting care for snails or slugs, but found none; not even after a refreshing shower of rain. The next day my plants were further destroyed, but the deströyer

was still invisible. I therefore concluded that it must be some nocturnal feeder, and with a candle and lantern, soon after twelve o'clock, visited my plants, when, to my great astonishment, I found them covered with earwigs, eating with great avidity. From one little plant, with only two leaves, and those not two inches long, I took off sixteen.—Repeating this for two or three nights I saved all my nursery.—In the same garden I had several dwarf trees of the russet apple, the fruit of which, when I came to gather it, was totally destroyed. The outside looked plump and fine, but the apples were hollow, the whole of the inside being scooped out. There were from four to six earwigs in each apple; and though each had excavated a large portion, they did not intrude on one another.

The bowl of a tobacco-pipe, and the claws of lobsters stuck upon sticks that support flowers, is an usual method of taking these insects, as they creep into holes and dark places in the day time. Placing hollow reeds behind twigs of wall trees is also a good mode, if they be examined and cleared every morning; but a midnight visit will do more in an hour than by the other means can be done in a week. I remember, some years since, going into a garden between twelve and one o'clock in a dark night, and, on returning to the house, I found the door and door-posts entirely covered with earwigs, in such numbers, and so close together, that they resembled bees in a swarm.

There are but two species of earwigs at present known in this country, the *Forficula auricularia*, just described, and the *Forficula minor*; the latter is very small, not one third as big as the other, but in every

other respect like it, and furnished with wings equally beautiful. I have rarely found this insect in a creeping state, but just at sun-set flying in great numbers. Some years since I was much entertained on a summer's evening in watching their return to a melon-pit; when, as soon as they got under the glass frame, they entered the earth. I have seen them now, for several nights past, just before the sun dips below the horizon, hastening home, but have not been able to trace their nocturnal habitation; but this circumstance seems to prove that this species feed in the daytime.—If the foregoing account should be thought deserving a place in your Recreations, and be of the least entertainment to your readers, it will be a high gratification to

ENTOMOPHILUS.

MISCELLANEOUS LITERATURE.

On the Art of Reasoning.

God made man upright; but he hath found out many inventions.

I DO not know any art that is so difficult to learn as the art of reasoning; and I think, that the man who should acquire the skill of teaching that art to the bulk of mankind would deserve immortal honour, like Ceres or Bacchus, or the inventors of other useful arts. But this, I am afraid, we can scarcely expect to see in our day; for it presupposes another kind of knowledge, to which mankind seem to have an insu-

perable aversion, viz. the art of thinking; to avoid which, many people would consent to be shot, or drowned, or carried to the gallows itself—or, in short, would put their lives, fortunes, or even their consciences, in the power of another. But the more hopeless the task, the more glorious would be the achievement, could it be effected. I therefore beg leave to propose this as a very proper subject for the consideration of some of my enterprising readers. It is a task that they may easily believe I shall not attempt myself; for, as it is a most necessary work to pluck the beam out of one's own eye before one can see clearly to remove the mote from our neighbour's, I am afraid, were I now to attempt this, these eyes of mine would be closed in everlasting night before half the task could be accomplished.

But, though I cannot attempt to remove the evil, I shall at least have a better chance of persuading another to undertake the task, by proving to him that the evil does actually exist, than by merely saying that it does so. With that view, I shall adduce a few examples of this sort, which will put him into a train of discovering many others when he chooses to apply his mind to that subject.

Those who have dipped a little into the history of the human mind, and have read the works of Duns Scotus, Paracelsus, Sandigovius, and others, will readily admit, that the art of reasoning was not well understood by these philosophers, whose system was only to confound the understanding by the subtleties of ratiocination. And though Bacon—both Bacons—(what a fortunate name!) made bold attempts to accomplish

the task which I now recommend, yet they both failed; though one of them was so fortunate as to destroy at once the infallibility of Aristotle, and, as a remote consequence of it, the infallibility of the pope of Rome. Yet human weakness is such, that, like the children of Israel of old, no sooner was Moses, who had destroyed the idols of antiquity, removed out of sight, than they made new idols for themselves, stocks and stones, the workmanship of their own hands, whom they have worshipped with the most abject adoration.

Among the foremost in this idolatrous career have been the chemical philosophers. The first idol they set up for themselves, in modern times, was an indefinite monster, a perfect Proteus, who, under the name of *salt*, *sulphur*, and *mercury*, could be made to assume all shapes, and do every thing that the imagination could conceive, not excepting even impossibilities themselves; and all this with the utmost facility imaginable. It was, indeed, but repeating these talismanic names a certain number of times, and jumbling them together in a certain mysterious way, and the thing was done; and this kind of hocus pocus art they called the *art of reasoning*.

But as, in this world, no wonder can last for ever, this deity in time gradually lost his influence among the people; and those talismanic orations, which were deemed at one time the perfection of reasoning, got so far out of fashion, that they lost their name; and, instead of reasoning, they were called unintelligible jargon—so *salts*, *sulphur*, and *mercury*, were kicked quite out of doors, and a new idol was erected in their stead.

As the former idol was undefined, a certain junto formed a plan to place in its stead one that should not have the same fault; and as nothing can be more definite than a needle, which, as every body knows, has a sharp point and a solid body, these philosophers, without troubling themselves about the eye, having invested it, by the breath of their lips, with divine omnipotence, fell down before this creature of their own formation, and worshipped it. But as, upon trial, they found that it would best answer their purpose to give their needle a case, by means of which its sharp point might be occasionally obtunded, they granted this unto their needle; and although it must appear not a little extraordinary to us to think how it would be possible, by means of this needle and sheath, to explain every thing in nature, yet, such is the power of philosophic legerdemain, that they found no sort of difficulty in it; for, by a dexterous shuffling of these needles and sheaths, and sharpening and obtunding them as occasion might require, they soon came to *satisfy themselves*, and the whole world *for a time*, that they could thus unravel all the mysteries of nature with the most perfect facility;—and this they also called the *art of reasoning*.

But this new idol did not continue to bear sway for such a length of time, or with such despotic power, as its predecessor had done; there are even some who still say that he never obtained universal adoration; for that there always was a strong sect, who wished to establish, under a few modifications of power, the former divinity; and these at last, under the name of *phlogistonians*, acquired such power as to kick the

needles and sheaths out of doors, and consecrate *phlogiston* in their stead; but the influence of this deity was much curtailed, in comparison with the former, by the restraining influence of some of the disciples of Bacon, who, by means of a strong unyielding chain called *experiment*, gagged the mouths of his most zealous votaries, which greatly checked them in the rapidity of their progress in this new modification of the *art of reasoning*.

At length a mighty sect arose, which looked upon phlogistonism as a perfect abomination; they therefore banished it from among men, and loaded it with the most opprobrious epithets; and, waxing great in power, they created a new divinity, of gigantic stature and unmeasureable dimensions, compared with which, that idol reared of old by Darius in the plains of Dura was but a dwarf; and they commanded that all nations, and kindreds, and languages of the earth, should fall down before it, and worship it, under the dreaded penalty of literary opprobrium. This new phantom of human creation they invested with the name of *nomenclature*, the principal functionaries under whose influence were called *oxygen*, *hydrogen*, and *nitrogen*. *Salt*, *sulphur*, and *mercury*, were not employed with greater dexterity by the old chemists for explaining *all* the phenomena of nature, than *oxygen*, *hydrogen*, and *nitrogen*, are by the new; which, operating for the present time as a talismanic key, lays open all the secrets of nature with the most enchanting facility; for nothing can stand before them; omniscience is of course conferred upon those who are in possession of it, and know how to use it. And this also they call *the art of reasoning*.

Having contemplated the beauty of this work of their own hands, their hearts waxed vain, and, swelling with pride, they utterly forgot their own insignificance; and, like Nebuchadnezzar of old, they said in their hearts, "Is not this great Babylon that I have built for the house of the kingdom, by the might of my power, and for the honour of my majesty?" and, regardless of the fate that had followed this vain-glorious boast, they would fain flatter themselves that their work shall be eternal, and that their names shall be with honour transmitted along with it to all future ages. Such is the weakness of man! for ever seduced by the allurements of self-love, his eyes are blinded for a time, so that he can discover nothing but beauties in his own productions; regardless of the experience of all ages, which might shew him that the same farce has been repeated from age to age since the beginning of time, and that, still confident of his infallible attainments, man advances with confidence, though experience soon discovers that he scarcely has yet penetrated even the surface of things whose essence he thinks he has been able fully to comprehend.

But if succeeding generations have thus perpetually developed the fallacies of the past, ought it not to excite in us an extreme degree of astonishment to perceive that in these latter times such a reiterated series of experiences should have had so little effect as not to check the vain, I had almost said the impious, attempt to denominate objects from the real simple and original elements of which they consist; as if it were possible for man ever to ascertain the real principles of any one thing in nature! The worm thus assumes the

province of a god; and he who knoweth nothing arrogates to himself the faculty of omniscience. But if great be the power of wine, if great be the power of women, greater still, we must allow, is the power of vanity. If one of the greatest heroes of antiquity could be so far seduced by the fascinations of a wench, as to be made to convert his spear into a distaff, need we be surprised that men of even the greatest talents should not be able to resist the alluring seductions of vanity?—But, great as are the seductions of self-adoration, and irresistible as is its power for a time, yet greater still is the power of truth, which abideth for ever unchangeably the same, and which shall finally overturn in future, as in times past, the power of every species of idolatry that the heart of man can conceive; and no one delusion that ever existed, that was equally universal in its sway, has been, in all probability, of shorter duration, than that will be of which I now complain. At the very moment that I write, those even who most admire the beauty of the structure must feel that its basis rests on sand, and that of course it soon must fall; for, assuredly, no sensible man, when he seriously reflects, can deliberately pretend to say, however much his wishes may make him incline to do so, that any human being hath as yet obtained with *certainty* the knowledge of any one simple element of nature. And if he has not—who can pretend to say, that other men may not proceed farther in their analysis than we have done?—Ought not the discoveries of the present day themselves to have convinced these men that this not only may, but even must be the case? If so, what is to

be the consequence, but a continual mutation of names, that shall have no end? So that this new nomenclature, instead of perpetuating the talents of its inventors, as was no doubt intended, will only preserve, as long as a vestige of it remains, the recollection of their presumptuous imbecility; and it will, probably, at last be branded with the opprobrious epithet of the *mania Babyloniana*.

Let it not be conceived, that I mean by these strictures to disparage the discoveries of modern times in this very important department of science. So far is this from being the case, that few persons can have a higher opinion than I have of the brilliancy and utility of these discoveries, and the extent of talents that has been displayed by some of the discoverers. All that I complain of is, the inconsiderate and presumptuous vanity of those, who, having just touched the threshold of the temple, should, without hesitation, presume to define all its proportions, and set bounds to its extent. But I must not myself forget that bounds are set to the extent of this work, which I must not transgress. I shall, therefore, content myself with adducing one single example of the mode of philosophising in this new school, in order that we may be enabled to judge whether they are entitled to the character of infallibility more than their predecessors.

The system that the immortal Bacon invented, to serve as a check to those fanaticisms which, under the name of reasoning, had served to sap the very foundations of all reason, was, in the first place, to take nothing that assumed the appearance of a *fact* for granted; and, before it was admitted as a founda-

tion for any sort of reasoning, to have its claim to authenticity ascertained with the most scrupulous accuracy, so as to shew that we cannot possibly be under any mistake respecting it. To this doctrine all the philosophers of the present day *theoretically* assent; but practice does not in all cases correspond exactly with theory, especially when new theories are to be formed; for, were this rule to be rigidly followed, it would so much retard the progress of men of *great genius* as not to give them time to distinguish themselves from the *swinish multitude*, who may drudge on in the mire as long as they please, while the others, mounting their Pegases, soar aloft beyond the sight of ordinary men, where they discover things “unattempted yet in prose or rhyme.”

That man is naturally an imitative animal no one will deny; nor are philosophers, notwithstanding their high pretensions to originality, an exception to this rule. When one among them who has taken the lead sets an example, by introducing a particular hypothesis, all the others follow him without hesitation, even as the silly sheep follow their leader when he takes a blind leap in cases of emergency, were it even to their own destruction. Of this disposition in these animals I once witnessed a singular and very laughable instance in the town of Liverpool, which was as follows.

A butcher's boy was driving about a score of fat wedders through the town; but they ran down a street through which he did not wish them to go. He saw a scavenger sweeping the street a little before them, and called to him to stop the sheep. The man ac-

cordingly did what he could to turn them back, running from side to side of the street, always opposing himself to their passage, and brandishing his broom with great dexterity; but the sheep, much agitated, still pressed forward; at last, the leader of the troop came right up to the man, who, fearing it was preparing to jump over his head while he was stooping, raised his body erect, and grasping the broomstick in both hands, held it right over his head as high as he could raise it. In this position he stood for a few seconds, when the sheep made a spring, and jumped fairly over his head, without touching the broom.—The first had no sooner cleared this bar than another followed, and another, and another, in such quick succession that the man, confounded, seemed to lose all recollection, and stood in the same attitude till the whole had jumped fairly over his head, not one of them attempting to pass on either side of him, though the street was there quite clear. As it was a wet season, the poor fellow was so entirely bespattered with dirt before they had all passed, that not an eye was to be seen in his head; so that it was not surprising to see him stand still in the same attitude for some time after the sheep had all made their escape; nor did I ever see a more ridiculous appearance than the poor fellow made on that occasion.

Now, it is evident, that however excuseable it was in the first sheep to attempt that way of passing, as it found the man in his way whichever way it turned itself; it is equally evident, that nothing but pure stupidity could induce the silly animals that followed; since they must have perceived, if they had reflected

but one moment, that as the man was standing still they had only occasion to pass by on either side of him. Many instances of a similar kind occur in the history of philosophy. A man of great powers chances, by some accidental circumstances, to be induced to advance an opinion, which a very little consideration would enable those who succeed him to perceive was erroneous; yet it may happen, that thousands will implicitly adopt it, and repeat it as a self-evident proposition for ages together, without ever taking the trouble to employ a thought upon the subject. An instance of this sort is just now in my eye, which I shall beg leave to lay before my readers as a proof that we are not yet so far advanced in the art of reasoning as to entitle us to the claim of infallibility more than our forefathers.

I have already noticed, that it has for many years been admitted as an undeniable axiom (if you please to admit that term in this case), that all the calcareous matter that is found on this globe is of animal origin; and were any one to say abruptly, that he doubted the fact, he would be accounted an ignoramus, and treated, of course, with the highest degree of contempt. Regardless of this, however, let us for the present endeavour to discover how this opinion quadrates with well authenticated facts respecting the state of our globe.

It is well known, that calcareous matter is not equally and uniformly distributed in detached particles all over every part of this globe; but is so entirely wanting, in some large districts where animals much abound, that a single ounce of it can scarcely be

found together, while in other extensive districts it is found in immense masses of solid matter, without the mixture of any thing extraneous, for a prodigious extent. The largest mass of calcareous matter that I have yet heard of, is that immense range of mountains called the Alps; which for many hundreds of miles in length, for at least fifty miles in breadth, and to a depth perhaps of several miles, exhibits scarcely a single particle of any thing else than calcareous matter, chiefly in the state of marble. Now let us try to discover in what manner this could have taken its rise from animals.

It is admitted, that the bones of animals in general, and their shells, afford a certain proportion of calcareous matter; and as we know more of the human species than any other animal, let us endeavour to take the quantity of calcareous matter that the human species would have afforded, had it all been accumulated in one place and preserved, to give us a sort of a notion of what would have been produced by the whole.

It is in general believed, that this globe has subsisted about four thousand years; and, by the best calculations we have been able to make, it does not appear that the population of all that we know of this globe at present exceeds three hundred millions of souls. Let us suppose, that the population has been the same for the whole four thousand years, and that three generations make up the century. In that case, the whole number that would die in a century would be 900 millions. At this rate, the whole number of

human beings that have ever existed on the globe would amount to 36,000 millions.

A human body in its perfect state measures about five cubical feet; and if we suppose that the calcareous matter in that body, when reduced to its pure mineral state divested of every mineral substance, would measure one twentieth part of that, it will be a full proportion. Hence it would follow, that from the whole there would remain 1800 millions of cubical feet of calcareous matter from this source. If we suppose, that the whole of the other animals on this globe exceed the human species in the proportion of a hundred to one, I suppose it would not be an over proportion: but, not to split hairs, let it be called a thousand. (or ten thousand, if you please), and that these, on an average, afforded an equal proportion of calcareous matter; this would leave an aggregate of 180,000 millions of cubical feet for the whole of the aggregate mass on this globe.—Let us now see how this will tally with the calcareous matter that is known to exist upon our globe: and first of the Alps.

We shall say, then, that the calcareous Alps extend in length five hundred miles, in breadth fifty, and one mile in depth; this would amount to 25,000 cubical miles. One cubical mile contains 15,749 millions of cubical feet; and of course 25,000 gives 393,725,000 millions; which is more than two thousand times the quantity of calcareous matter that all these animals could have afforded.—But that all these animal calcareous remains (supposing that they should have equalled it in quantity) could have been brought to one place, and there deposited without any extraneous matter,

while not a vestige of them should have been deposited elsewhere, is a proposition that no person who is not in the dream of a delirium can seriously believe.

Great, however, as this mass of calcareous matter is, and impossible as it may be to suppose it could have been produced by mere animal remains, our difficulties would not rest here, were we to attempt to support that hypothesis; for there is reason to believe, that, great as this mass of calcareous matter is, it does not amount to one thousandth part of the whole of the calcareous matter on this globe; for this is distributed in masses more universally and in greater abundance than perhaps any other mineral substance that is known on the globe; and when we farther consider, that there is good reason to believe that many other mineral productions are merely modifications of calcareous matter disguised under different forms, there are perhaps few opinions that man could possibly adopt with less apparent foundation than this universally received hypothesis.

That pit coal is universally produced from wood, is another hypothesis equally current, and which derives its source from a similar origin. The leader has first jumped over the poor fellow with his broom, and all the rest must necessarily follow him. What a pitiable state would an ingenious young fellow be in, who were to think for himself, and reason as I now do in regard to these objects! He would be driven from the flock as an unsound member of it; and what young fellow can bear the idea of this kind of ostracism, which would drive him for ever from the haunts in which he would delight to wander; to avoid this,

he must even jump as well as others.—Even I myself, who am not of the timid order of beings, have not been able, without a considerable effort, to prevail upon myself to publish this to the world; but the cause of truth requires it; and in maintaining that cause no difficulty ought to be regarded.

I have read in a work of great ingenuity, lately published by a man who ranks among the first for literary talents in this country, and who *of course* belongs to the sect referred to above, that calcareous matter forms one of the ingredients which constitute the food of plants—And why? Because, says he, plants are found always to contain a proportion of calcareous matter. So far well.

Again, he finds, that calcareous matter forms also a constituent part of the food of animals—And why? Because, the bones, shells, and other parts of animal bodies, are found to contain a large proportion of calcareous matter. Very well again.

On reading a few pages more, I find, from the same author (none of whose tenets, assuredly, I attribute to him exclusively), that all the calcareous matter which is found on this globe *is of animal origin*.

Now, these three positions being admitted as facts—and you are to observe, it is in this manner that the facts on which their reasoning rests are grounded, and on that reasoning that *infallible* deductions are made—let us, in our turn, try to reason upon them.

If all calcareous matter be of animal origin, it must follow, by the hypothesis, that the plants which grew upon this earth before animals existed upon it, could not possibly contain the smallest proportion of calcareous matter. Again:

If the calcareous matter that is found to constitute such an essential part of all animals be derived from its food, as must also be admitted according to the hypothesis, these first formed animals could not derive it from the vegetables they then ate; for these vegetables could then contain no such substance, as we have just seen. But as *all* animals (perhaps we might say; —but as *most* animals we shall say) subsist upon vegetables, either directly or indirectly, by feeding upon animals that have subsisted upon vegetables, they could not derive the calcareous matter from these sources. Neither could they derive it from any other kind of food, supposing other sources of animal nutriment should be discovered; for, by the hypothesis, none of the calcareous matter existed at that time in any part of the universe. Whence then did these animals obtain it?

We are thus driven round and round in a circle, which, like the circles of *Des Cartes*, when they are not closely investigated, may be employed to explain every possible phenomenon, but when accurately examined are discovered to be mere ideal phantoms, that had no real existence but in the imaginations of those who contemplated them. Substances may either be found in bodies that did not previously exist in that state, and that of course formed no part of the food of an organised body, or they must be originally created in these bodies by the will of Heaven; for in one or the other of these ways only could calcareous matter have been found either in animal or in vegetable bodies, if it be true that all calcareous matter is of animal origin.

If, on the other hand, it be true, that all substances of which organised bodies are found to consist, must of necessity have existed in that state before they entered into their composition, then it must follow as a necessary consequence, that calcareous matter cannot be of animal origin, but must have existed in this globe before either animals or vegetables were formed, and that calcareous matter must not have been deposited in mighty masses here and there like the Alps, which extend for many hundred miles in length, and in some places for at least one hundred miles in breadth, and for the greatest part of the way more (nobody can say how much more) than one mile in depth (what a monstrous congeries of animals must this have been!), but have been universally disseminated in every place where either animals or vegetables were to be found. I do not push this reasoning farther. These hints are perfectly sufficient to shew, that the present age has no claim to infallibility in reasoning, more than those that are past; and that, therefore, they have no title to arrogate to themselves that claim of infallibility which the system whereon they at present repose with such ineffable complacency must necessarily presuppose. I see no reason to believe that any human being, at the present hour, has discovered even a single elementary substance in nature; and if so, he cannot be possessed of data to form any one name, upon the principles of the new nomenclature, that shall be entitled to hold its place, according to the principles of their system, one moment after the fallacy in which the present name had been formed shall be discovered. The whole system,

then, is absurd, and impiously extravagant; because it rests upon a supposition, which not even the confidence of modern philosophy will dare to avow; viz. that the inventors of it were possessed of a *perfect* knowledge of the real primary elementary substances in nature.

Neither let it be conceived, that I wish to throw out any insinuations tending to detract from the merits of the person whose reasoning I have thus ventured to analyse. It was, in truth, because I respected the talents and the dispositions of the man, that I made choice of his work for an illustration. It would by no means have answered the purpose of the illustration if I had chanced to lay hold of some careless, insignificant draggler, in his heedless, ill-directed rambles through the seductive walks of literature. But if a man of the very first talents will mount his Pegasus, and urge him forward at the full top of his speed, through a country with which he is unacquainted, without taking the trouble first deliberately to explore the way, ought we to be surprised, if he should chance to run his head against a post, or get into a hobble, out of which he may find some small difficulty fairly to extricate himself. My aim in this essay is, not so much to inform the ignorant, as to moderate the impetuosity of those who feel the superiority of talents; for I am fully convinced, that superiority of talents much more frequently betrays the possessor into error, than the want of them; and as men in general are afraid to correct these aberrations, they are suffered long to remain as sources of error to the weaker but well-intentioned portion of the com-

munity. Who, I ask, but myself, would venture to publish this essay in the present day? I contend in the cause of truth; and in that cause I will stand unmoved, although, like Abdiel, I stood alone, and all others ranged themselves on the opposite side; nothing afraid of the decision of the age which many who read this will live to see.

Botanical Description of the Plant that produces the East-Indian Coutchouc. By Dr. Roxburgh.

AGREEABLE to my promise, I now proceed to give Dr. Roxburgh's description of the plant that produces the Coutchouc of Sumatra and Pulo-pinang, with farther remarks on that valuable substance.

Having obtained, he says, from Mr. FLEMING, very complete specimens, in full foliage, flowers, and fruit, "I was enabled to reduce it to its class and order in the *Linnæan* system. It forms a new genus in the class *pentandria* and order *monogynia*, and comes in immediately after *tabernæmontana*; consequently belongs to the thirtieth natural order, or class, called by LINNÆUS, in his natural method of classification or arrangement, *contortæ*. One of the qualities of the plants of this order is, their yielding, on being cut, a juice which is generally milky, and for the most part of a poisonous nature."

Dr. Roxburgh denominates this plant *URCEOLA elastica*, or coutchouc vine of Sumatra and Pulo-Pinang, and gives the following reasons for this denomination. "The generic name, *Urceola*," says he, "which I have given to this plant, is from the

structure of the corol; and the specific name from the quality of its thickened juice."

"It does not appear," Dr. Roxburgh says, "that this vine has been taken notice of by any European till now. A substance of the same nature with the Coutchouc, and probably the very same, was discovered in the island of *Mauritius* by M. POIVRE, and from thence sent to France; but, so far as I know, we are still ignorant of the plant that yields it.

"The impropriety of giving to *Coutchouc* the term gum, resin, or gum-resin, every one seems sensible of, as it possesses qualities totally different from all such substances as are usually arranged under those generic names: yet it still continues, by most authors I have met with, to be denominated elastic resin, or elastic gum. Some term it simply *Coutchouc*, which I wish may be considered as the generic name of all such concrete vegetable juices (mentioned in this memoir) as possess elasticity and inflammability, and are soluble in the essential oils without the assistance of heat;" and, although the name be not so pleasing to pronounce as some others, yet we wish the same rule may be adhered to universally.

Description of the Plant Urceola.

PENTANDRIA MONOGYNIA.

"GEN. CHAR. *Calyx*, beneath five-toothed; corol one petaled, pitcher-shaped, with its contracted mouth five-toothed: nectary entire, surrounding the germs; follicles two, round, drupacious; seeds numerous, immersed in pulp.

URCEOLA ELASTICA.

“ Shrubby, twining, leaves opposite, oblong, panicles terminal; is a native of *Sumatra*, *Pulo-pinang*, and *Malay* countries.

“ *Stem*, woody, climbing over trees, &c. to a very great extent, young shoots twining, and a little hairy, bark of the old woody parts thick, dark coloured, considerably uneven, a little scabrous, on which I found several species of moss, particularly large patches of *lichen*; the wood is white, light, and porous.

“ *Leaves*, opposite, short-petioled, horizontal, ovate, oblong, pointed, entire, a little scabrous, with a few white scattered hairs on the under side.

“ *Stipules*, none.

“ *Panicles*, terminal, brachiate, very ramous.

“ *Flowers*, numerous, minute, of a dull greenish colour, and hairy on the outside.

“ *Bracts*, lanceolate, one at each division and subdivision of the panicle.

“ *Calyx*, perianth, one-leaved, five-toothed, permanent.

“ *Corol*, one-petaled, pitcher-shaped, hairy, mouth much contracted, five toothed, divisions erect, acute, nectary entire, cylindrick, embracing the lower two thirds of the germ.

“ *Stamens*, filaments five, very short from the base to the corol. Anthers narrow-shaped, converging, bearing their pollen in two grooves on the inside near the apex: between these grooves and the insertions of the filaments they are covered with white soft hairs.

“ *Pistil*, germs two; above the nectary they are very hairy round the margins of their truncated tops. Style single, shorter than the stamens. Stigma ovate, with a circular band, dividing it into two portions of different colours.

“ *Per*. Follicles two, round, laterally compressed into the

shape of a turnip, wrinkled, leathery, about three inches in their greatest diameter; one celled, two valved.

“ *Seeds* very numerous, reniform, immersed in firm fleshy pulp.”

I thought it necessary to give the botanical description complete, that those into whose hands this volume may fall may be at no loss to recognise this valuable plant wherever they may find it.

I much regret that nothing is said in regard to the way in which it may be easiest propagated. Does it strike by cuttings? Can it be propagated by layers? Does it send up suckers from the root? Can it be propagated like the bread fruit tree now in Jamaica by cuttings of its roots, which has been found to succeed when every other mode failed? [Might not the propagation of the camphor tree be thus effected?] Do the seeds readily germinate when sown? Can these seeds be kept for any considerable length of time without losing their vegetative power? Do plants from the seed grow up quickly? How many years old must the plants be before they can be made to afford good Coutchouc? I hope my correspondents in India will take the earliest opportunity of communicating information on these heads, and every thing else that occurs connected with them; and I flatter myself that now, when the spirit of inquiry is alive in India respecting the best modes of increasing useful productions of all sorts, this one will not be neglected; and that in pursuance of the plan so judiciously chalked out by Dr. Anderson, seeds or plants of it will be sent to our distant settlements, where it is likely to thrive, particularly Sierra Leone, taking care to drop some of them

at every place the vessels touch at by the way, particularly the Cape, and St. Helena, to insure the best chance of their succeeding. Sierra Leone, because of its vicinity to Britain, is the only settlement belonging to this country where there seems to be a probability of its being cultivated with a view to its promoting, in an essential degree, the manufactures of Britain. And I beg leave here once more to direct the attention of persons who go to the coast of Africa towards the discovery of this or some other plant that yields a kind of coutchouc, a native of that country, a specimen of which coutchouc I saw in the possession of Mr. Roscoe of Liverpool.

Dr. Roxburgh made several experiments on the hardened juice of the *Urceola elastica*, which he specifies as follows:

“ From wounds made in the bark of this plant there oozes out a milky fluid [Quere. Is it from the bark only that the fluid oozes, or does a greater quantity flow when the wood also is cut? Does this last circumstance affect the quality of the coutchouc? If it be obtained from the bark only, does the drawing of that juice kill the plant above that place, or injure it; and to what degree?] which, on exposure to the open air, separates into a coagulum and watery liquid apparently of no use after the separation takes place. [I presume Dr. Roxburgh here writes upon the information he had received, not from his own observations; so that in this particular Mr. Howison’s account seems to be most to be relied upon]. This coagulum is not only like the American coutchouc, or Indian rubber, but possesses the same properties,

as will be seen from the following experiments and observations made on some which had been extracted from the vine about five months ago. A ball of it now before me is, to my sense, totally void of smell, even when cut into; is very firm, nearly spherical, measures nine and a half inches in circumference, and weighs seven ounces and a quarter; its colour on the outside is that of American coutchouc, where fresh cut into of a light brown colour, till the action of the air darkens it: throughout there are numerous small cells filled with a portion of the light brown watery liquid abovementioned. This ball in simply falling from a height of fifteen feet [upon what kind of floor?] rebounds about ten or twelve times; the first is from five to seven feet high, the succeeding ones of course lessening by gradation.

“ This substance is not soluble in the abovementioned liquid contained in its cells, although so intimately blended therewith when first drawn from the plant, as to render it so thin as to be readily applied to the various purposes to which it is so well adapted when in a fluid state.

“ From what has been said, it will be evident, that this coutchouc possesses a considerable share of solidity and elasticity in an eminent degree. I compared the last quality with that of American coutchouc, by taking small slips of each, and extending them till they broke; that of *Urceola* was found capable of bearing a much greater degree of extension [and contraction] than the American: however, this may be owing to the time at which the respective substances had been drawn from the plants.

“ The *Urceola* coutchouc rubs out the marks of a

black lead pencil as readily as the American, and is evidently the substance of which the Chinese make their elastic rings.

“ It contains much combustible matter, burning entirely away with a clear flame, emitting a considerable deal of dark coloured smoke, which readily condenses into a large proportion of exceeding fine soot, or lamp black; at the same time it gives but little smell. The combustion is often so rapid, as to cause drops of a black liquid, very like tar, to fall upon the burning mass; this is equally inflammable with the rest, and continues when cold in its fluid state, but totally void of elasticity. In America the coutchouc is used for torches; ours appears to be equally fit for that purpose. Exposed in a silver spoon to a heat about equal to that which melts lead or tin, it is reduced into a thick, black, inflammable liquid, such as drops from it during combustion; and is equally deprived of its elastic powers, consequently rendered unfit for those purposes for which its original elasticity rendered it so proper. It is insoluble in spirits of wine; nor has water any effect on it, except when assisted by heat, and then it is only softened by it.

“ Sulphuric acid reduced it into a black, brittle, charcoal-like substance, beginning at the surface of the coutchouc; and if the pieces are not very thin or small, it requires some days to penetrate to their centre: during the process the acid is rendered very dark coloured, almost black. If the sulphuric acid is previously diluted, with only an equal quantity of water, it does not then appear to have any effect on this

substance, nor is the colour of the liquid changed thereby.

“ Nitric acid reduced it in twelve hours to a soft, yellow, unelastic mass, while the acid is rendered yellow; at the end of two days the coutchouc had acquired some degree of friability and hardness. The same experiment made on American coutchouc was attended with similar effects. Muriatic acid had no effect on it.

“ Sulphuric æther only softened it, and rendered the minute portions it was cut into easily united, without any seeming diminution of its elasticity.

“ Nitric æther I did not find a better menstruum than the vitriolic; consequently, if the æther I employed was pure, of which I have some doubt, this substance must differ essentially from that of America, which BERNEARD reports to be soluble in nitric æther. [I suspect the æther here used may have been weakened, either by being badly stopped up, or some other accident; for I have found that nitric æther under these circumstances did not dissolve American coutchouc.]

“ Where the substance can be had in a fluid state, there is no necessity for dissolving or softening it to render it applicable to the various uses for which it may be required; but where the dry coutchouc is only procurable, sulphuric æther promises to be an useful medium, by which it may be rendered so soft as to be readily formed into a variety of shapes.

“ Like American coutchouc, it is soluble in oil of turpentine, and I find it equally so in *Cajeput* oil, an essential oil said to be obtained from the leaves of

Melaleuca leucadendron. Both solutions appear perfect, thick, and very glutinous. Spirits of wine added to the solution in Cajeput oil, soon united with the oil, and left the coutchouc floating on the mixture in a semifluid state, which, on being washed in the same liquor, and exposed to the air, became as firm as before it was dissolved, and retained its elastic powers perfectly; while in the intermediate states between fluid and firm, it could be drawn out into long transparent threads, resembling, in the polish of their surface, the fibres of the tendons of animals: when they broke, the elasticity was so great, that each end instantaneously returned to its respective mass. Through all these stages, the least pressure with the finger and thumb united different portions as perfectly as if they never had been separated; and without any clamminess, or sticking to the fingers, which renders most of the solutions of coutchouc so very unfit for the purposes for which they are required. A piece of catgut covered with the half inspissated solution, and rolled between two smooth surfaces, soon acquired a polish and consistence very proper for bougies. Cajeput oil I also found a menstruum for American coutchouc, which was as readily separated by the addition of a little spirits of wine or rum as the other; and appears equally fit for use, as I covered a piece of catgut with the washed solution as perfectly as with that of *Urceola*. The only difference I could observe, was a little more adhesiveness from its not drying so quickly: the oil of turpentine had greater attraction for the coutchouc than for the spirits of wine, consequently remained obstinately united to the former, which pre-

vented its being brought into that state of firmness fit for handling that it acquired when cajeput oil was the menstruum.

“ The cajeput solution employed as a varnish did not dry, but remained moist and clammy; whereas the turpentine solution dried pretty fast.

“ Expressed oil of olives and linseed proved imperfect menstruums while cold, as the coutchouc in several days was only rendered soft, and the oils viscid; but with a degree of heat equal to that which melts tin, continued for about twenty-five minutes, it was perfectly dissolved, but the solution remained thin, and void of elasticity. I also found it soluble in wax and in butter, in the same degree of heat; but still these solutions were without elasticity, or any appearance of being useful.

“ I shall now conclude what I have to say of the coutchouc, or *Urceola elastica*, with observing, that some philosophers of eminence have entertained doubts of the American coutchouc being a simple vegetable substance, and suspect it to be an artificial production; an idea which I hope the above detailed experiments will help to eradicate; and consequently to restore the histories of that substance by *M. de la Condamine* and others, to that degree of credit to which they seem justly entitled; in support of which it may be further observed, that besides *Urceola elastica*, there are many other trees of the torrid zone [and plants of temperate climates] that yield a milky juice, possessing qualities nearly of the same nature, as *Artocarpus integrifolia* (common jack tree), *Ficus re-*

ligiosus et indica, *Hippomane biglandulosa*, *Cecropia peltata*, &c.

“The coutchouc of the *figus religiosa* the Hindoos consider as the most tenacious vegetable juice that they are acquainted with; from it their best bird-lime is prepared. I have examined its qualities as well as those of *figus indica* and *artocarpus integrifolia*, by experiments similar to those above related, and found them triflingly elastic when compared with the American and *Urceola elastica*; but infinitely more viscid than either: they are all inflammable, though in a less degree, and show nearly the same phenomena when immersed in mineral acids, solution of alkali, alcohol, fat, and essential oils; but the solution in cadjeput oil could not be separated by spirits of wine and collected again, like the solutions of the *Urceola* and American coutchoucs.”

I have inserted the above valuable memoir more at large than is usual with me, because of the many important inferences that may be deduced therefrom by every reader who adverts to it. Whether the *cadjeput* oil (with which I am entirely unacquainted) be ever introduced as an article of commerce into this country, I know not, and will be glad of any farther information respecting it by such of my readers as are qualified to give it; but if it be not, it certainly deserves to be imported for that purpose; for many are the uses that might be made of it in surgery and arts for the purposes above specified, could it be obtained here, at first for the sake of experiment, and afterwards in quantities to serve the various purposes in works at large that it should be found to be fit for.

The fact is now clearly established, that a concrete vegetable juice of the nature of coutchouc can be obtained from a diversity of trees and plants; probably from many more than is at present suspected; and that these concretes differ from each other in regard to the intenseness or remissness of some of their constituent qualities; some of them possessing the elastic quality, and some of them the viscid quality, in a much more eminent degree than the others; and so on in regard to other particulars. But, as these very peculiarities may render one superior to the other for particular purposes, it is of much importance that they should be accurately compared with each other in all these respects. Dr. Roxburgh's observations may serve as a beginning to this set of experiments.

As various plants are now proved to contain this substance, it will naturally stimulate the attention of those who explore unknown regions, and direct them to investigate the qualities of milky juices wherever they occur; and in the course of these investigations they may be led to discoveries of very great importance; for the virus of these juices, considered in a medical point of view, are very powerful; witness opium. It is probable, that among the milk-bearing plants some may yet be discovered nearer home than any that are at present known, particularly on the coast of Africa, that may afford a true elastic coutchouc equal in all respects to that of America; which would be indeed a valuable discovery. I have already mentioned the circumstance that renders this not only probable, but the next thing to a certainty. Were

the Society of Arts to offer a suitable premium to the person who should make this discovery, and ascertain the plant that produces it, and where it grows, it would no doubt stimulate research among those seafaring men who visit these coasts, that might be attended with very beneficial consequences to the country.

To the Editor of Recreations in Agriculture, &c.

ON DESCRIPTIVE POETRY.

SIR,

I HAVE occasionally read in your valuable *repository* of *Recreations*, critical remarks on poetry; which always appeared to me perfectly consistent with the nature of your work: for poetry, at least in its sublime, which is its true, sense, being conversant in the different appearances of the material, as well as the intellectual world, and loving such studies and employments as are natural, may be very properly supposed to fall under your notice, and will necessarily administer pleasure to the majority of your readers.

As poetry, in general, according to Aristotle, consists in imitation, it might be no useless investigation, to inquire, in what such imitation consists; to distinguish the genuine imitator of nature from the mere imitator of other poets; to point out the excellencies of the former character; and to shew the marks that particularise the latter. But these subjects would lead into a wide field of inquiry, and, after all, it would only be over beaten ground.

That sort of poetry which appears more properly to

fall under your consideration, is pastoral and descriptive, both of which have their appropriate place under the general head of imitation; consisting either in a representation of the manners and passions of persons employed in country occupations, or in the painting of rural appearances, and in the reviving of familiar associations and genuine impressions; such as will naturally engage the attention of him who surveys rural scenes with a poet's eye, and feels them, if I may so express myself, with a poet's feeling.

Several of our English writers, were it proper to go into nice discriminations, I should certainly beg leave to exclude from that class of poets (though without refusing them their proper praise) to which the title of their compositions, or the courtesy of their readers have advanced them.

To such writers I should refuse this palm, in proportion as I saw the appearances described by them were not congenial to the countries whence they took their observations; or, as the manners and pursuits were dissimilar; in proportion, too, as I could trace, not from hasty and inaccurate conclusions, but from circumstances well authenticated, and indubitable marks of imitation, that their paintings were not their own, but copies from other artists. This has been done by several critics with respect to Pope, when compared with Virgil; and, indeed, in part by Pope himself; it has been also performed with regard to Virgil, when compared with Theocritus, by a German critic.

On this principle we call Theocritus a truly rural and descriptive poet, because he is supposed to have described manners, customs, and appearances, as it

were, in their own place: he delineates what is real as to its existence, as well as familiar to his own eye; and what, so far as we know, he borrowed not, in scraps and fragments, from former poets.

Thomson, the author of the *Seasons*, is a writer of the same kind. This amiable poet was born in a pastoral country, and his youthful mind was stored with ideas which the scenery of the Highlands could not fail to impress on his mind. In early life he became a poet; and, though afterwards far removed from a country so eminently favourable to poetic images and poetic feelings, he still retained a recollection of the romantic scenery, and a love for rural manners:* and, though he is not always perhaps to be commended for the structure of his verse, as a descriptive poet, he cannot be admired too much. Dyer, the author of the *Fleece*, is a poet of a similar character, and was formed under similar circumstances; though not so happy as the author of the *Seasons* in the choice of a subject.

Of the pastoral or descriptive kind of poets are also several other writers, who have not gone so largely into a given subject; but who answer, more or less, to the character of descriptive or pastoral poets, in proportion as they follow or neglect the principles which have been just laid down, and by which we should examine their pretensions; such are Collins, Shenstone, and some of the earlier Scotch poets, who

* It may be proper for the admirers of Thomson to notice, that some of his most beautiful pictures are taken from his own country, Scotland, rather than England; more particularly his appropriate description of the Reapers,

have written odes, songs, or ballads. Collins mixes strong personification with natural pictures, both in perfect consistency with that kind of poetry; but the Scotch writers alluded to confine themselves to native scenes and simple passion. It would perhaps be difficult to find more charming little poems of this kind than *Eweboughts Marion*, *Tweed Side*, the *Flowers of the Forest*,—if indeed an ancient poem,—*Roslin Castle*, and others.

But, sir, I shall not here attempt to discuss this extensive and important subject, but merely point out the principle on which the truth of this pleasing species of writing rests. I was led into these hints merely by reading a poem that has just made its appearance, and which is strongly characterised by these excellencies; I mean the *Farmer's Boy*.

I stop not to inquire into its particular blemishes arising out of the circumstances of the author; for if some defects must allowedly be traced to those circumstances, yet will it be admitted that its most striking touches are to be traced to the same cause. And if we behold in Thomson an elegant scholar adorning the simple beauties of nature from the stores of a cultivated mind, we see in Robert Bloomfield, a simple farmer's boy, painting such scenes as no poet need be ashamed to own.

We will insert (and we think our readers will be pleased with the insertion) at the end of these observations a specimen of the descriptive powers displayed in this poem; and shall select a picture, of the merit of which, as being very familiar, every reader will be capable of forming a ready and accurate judgment.

No more the fields with scatter'd grain supply
The restless wand'ring tenants of the sty;
From oak to oak they run with eager haste,
And wrangling share the first delicious taste
Of falling acorns, yet but thinly found,
Till the strong gale have shook them to the ground.
It comes; and roaring woods obedient wave:
Their home well pleas'd the joint adventurers leave:
The trudging sow leads forth her numerous young,
Playful, and white, and clean, the briars among,
Till briars and thorns increasing, fence them round,
Where last year's mould'ring leaves bestrew the ground,
And o'er their heads, loud lash'd by furious squalls,
Bright from their cups the rattling treasure falls;
Hot thirsty food; whence doubly sweet and cool
The welcome margin of some rush-grown pool,
The wild duck's lonely haunt, whose jealous eye
Guards every point; who sits prepar'd to fly,
On the calm bosom of her little lake,
Too closely screen'd for ruffian winds to shake;
And as the bold intruders press around,
At once she starts, and rises with a bound:
With bristles rais'd the sudden noise they hear,
And ludicrously wild, and wing'd with fear,
The herd decamp with more than swinish speed,
And snorting dash through sedge, and rush, and reed:
Through tangling thickets headlong on they go,
Then stop, and listen for their fancied foe;
The hindmost still the growing panic spreads;
Repeated fright the first alarm succeeds;
Till Folly's wages, wounds and thorns, they reap:
Yet glorying in their fortunate escape,
Their groundless terrors by degrees soon cease,
And Night's dark reign restores their wonted peace.
For now the gale subsides, and from each bough
The roosting pheasant's short but frequent crow
Invites to rest; and huddling side by side,
The herd in closest ambush seek to hide;

Seek some warm slope with shagged mofs o'erspread,
Dry'd leaves their copious covering and their bed.
In vain may Giles, through gath'ring glooms that fall,
And solemn silence, urge his piercing call:
Whole days and nights they tarry midst their store,
Nor quit the woods till oaks can yield no more.

BLOOMFIELD'S Farmer's Boy.

THE Editor feels himself much obliged to his ingenious correspondent for the foregoing observations on a subject that had strongly attracted his notice, and on which it was his intention to have offered some remarks as soon as he could overtake it. He had read this little poem in manuscript with much satisfaction, though not without a sensation of uneasiness when he understood what was the situation of the author, and the measures that were in contemplation for bringing him forward to public notice. He knew from long experience, that the human mind is subjected to such delicate susceptibilities, that happiness is often destroyed by the very measures which are intended to promote it. Those who have not adverted to this circumstance so strongly as he has done, are apt to rank the efforts that are made to patronise genius, to raise a person from obscurity into notice, and to add in some degree to the amount of his income by pecuniary donations, among the most satisfactory exertions of beneficence: to him, on the contrary, such exertions too often appear in the light of the severest cruelty; not intentional cruelty assuredly, but that which originates in men following the impulse of the moment, where the future consequences of their actions are not perceived at the time, nor any trouble bestowed to investigate in future what they have been.

It is not a light thing assuredly, to awaken desires in the human mind that may never have a chance of being gratified, and which, but for these inconsiderate efforts, might have lain for ever dormant. And if the mind in which these desires are excited be susceptible of the strongest impressions, as is too often the case with persons of genius, the cruelty becomes excessive; because it is thrown into a situation in which its warmest susceptibilities are aroused, without being put in possession of the means of indulging in the gratifications which then become necessary. Family connexions that, but for this circumstance, might have proved the balm of life, from this species of derangement on some occasions becomes its bane; and, instead of that tranquil independence in an humble station, which might have resulted from the well-directed efforts of continued industry, and the respectability that talents, when under the guidance of a modest beneficence, will ever insure in society, an uninterrupted struggle takes place, to rise into a line that is beyond their reach, which must either tend to excite sensations of despair, or induce servile compliances that the generous heart revolts at as beneath its dignity. The consequence is, the most excruciating misery that the heart can feel independent of guilt: and who can say, that, under the extremity of anguish, guilt itself will be at all times avoided?

These considerations, occasioned by the recollection of events of a very recent date, made a strong and melancholy impression: nor was it possible for him to contemplate the probable fate of Robert Bloomfield, under circumstances so nearly similar to those alluded to, without a sensation of the warmest interest. He

is happy, however, in thinking, that he now perceives reasons for believing that his fears may be in some measure unfounded; he is willing, at least, to indulge the hope that it may be so. In attentively studying the little poem from which the above extract has been made, in connexion with the very well written memoirs of the author that precede it, he thinks the characteristic features of the poem are innocence and beneficence. We do not there observe a tendency to the lofty flights of Pindar; far less the enthusiastic wildness of the Dythirambic muse; we do not even perceive an attempt to reach the exhilarating strains of the lyric kind; it is every where, as my correspondent has justly characterised it, purely pastoral and descriptive. We discover no attempt at extraneous graces, none of the sportive flights of a wild imagination. Objects are every where observed with a serious attention, their peculiarities remarked with a nice discrimination, and the *tout ensemble* delineated with that native simplicity which proves irresistibly attractive to congenial minds. The author no where addresses himself to the fancy; his strains proceed directly from the sensations of a feeling heart, and they have all the appropriate delicacy which that so naturally inspires.

From this analysis may it not be inferred, that the seductions of vanity are not likely to prove so alluring to this author as to be able to divert his attention from the more heart-felt satisfaction of domestic comforts; that the notice which is taken of him may only tend to bring him acquainted with a few congenial souls, in whose conversation he may feel himself fortified in his natural propensities rather than deranged; so that,

without neglecting the relative duties that fall to his share in society, he may be enabled to enjoy the sweets of domestic comfort with a higher degree of relish than otherwise might have been within his reach. It is soothing to the mind to indulge these ideas, and it will prove highly consolatory to the writer to find that they are realised.

In recommending this poem to the notice of such readers as feel a strong propensity to contemplate the beauties of a pure innocence, another short quotation is given, for which it is hoped the indulgence of the reader will readily be obtained.

Short-sighted Dobbin!—thou canst only see
 The trivial hardships that encompass thee:
 Thy chains were freedom, and thy toils repose,
 Could the poor post-horse tell thee all his woes;
 Shew thee his bleeding shoulders, and unfold
 The dreadful anguish he endures for gold:
 Hir'd at each call of business, lust, or rage,
 That prompt the traveller on from stage to stage.
 Still on his strength depends their boasted speed;
 For them his limbs grow weak, his bare ribs bleed;
 And though he groaning quickens at command,
 Their extra shilling in the rider's hand
 Becomes his bitter scourge:—'tis he must feel
 The double efforts of the lash and steel;
 Till when, up-hill, the destin'd inn he gains,
 And trembling under complicated pains,
 Prone from his nostrils, darting on the ground,
 His breath emitted floats in clouds around:
 Drops chase each other down his chest and sides,
 And spatter'd mud his native colour hides:
 Through his swoln veins the boiling torrent flows,
 And every nerve a separate torture knows.
 His harness loos'd, he welcomes eager-eyed
 The pail's full draught that quivers by his side;

And joys to see the well-known stable door,
As the starv'd mariner the friendly shore.

Ah, well for him if here is suff'rings ceas'd,
And ample hours of rest his pains appeas'd!
But rous'd again, and sternly bade to rise,
And shake refreshing slumber from his eyes,
Ere his exhausted spirits can return,
Or through his frame reviving ardour burn,
Come forth he must, though limping, maim'd, and sore;
He bears the whip; the chaise is at the door—
The collar tightens, and again he feels
His half-heal'd wounds inflam'd; again the wheels
With tiresome sameness in his ears resound,
O'er blinding dust, or miles of flinty ground.
Thus nightly robb'd, and injur'd day by day,
His piece-meal murd'ers wear his life away.

For Dr. Anderson's Recreations.

A SAUNTERER'S WALK THROUGH LONDON.

I THANK you for your kind condescension in admitting my first essay. I now consider myself as a person of some kind of consequence, and am very ambitious of becoming more so still. I now begin to take notice of many things that I used to pass without entertaining a thought about them; and I think it is possible that I may in time come to make some remarks that will not perhaps be altogether undeserving of a place in your miscellany. But I know not how it is that I should feel a greater propensity to take notice of disagreeable incidents than those that are of a more pleasing kind, and to turn my thoughts rather towards the removing of things that incommode me, than to recreations that might prove positively amusing. Perhaps a time may come when I shall be able to think for myself, instead of requiring a flapper to rouse me, like the inhabitants of Laputa; but I am

not as yet advanced thus far. Will you have the goodness to indulge me, while I state to you another nuisance which has often incommoded me in my solitary walks through this great metropolis? Because I think I have discovered a contrivance by which it may be much alleviated, if not removed. If my proposal should meet with your approbation, I shall be much obliged to you if you will submit it to the consideration of the public.

Many times in my life have I been rather dissatisfied at having my walk interrupted by those boarded projections on the street that are usually put up in the fronts of houses while they are in a state of repair; but I do not recollect that there ever was a season in which I have been so often interrupted, or so deeply incommoded in this way, as during the present year; for the number of houses fronting the street that have been under repair has been so great, and the streets have been uniformly so wet and splashy, that the inconvenience to foot passengers has been much greater than is usual in drier seasons. It occurs to me, that the following contrivance might tend to diminish this inconvenience in future.

I suppose it is absolutely necessary that the proprietors of houses should obtain occasionally the exclusive use of a small area, part of the street, for the convenience of repairs when these are indispensable; but it is at the same time necessary that the public should suffer as little inconvenience for the accommodation of individuals as the nature of the case can possibly admit. I have remarked, however, that these encroachments are allowed in some cases to remain much longer than could have been necessary, had the

parties concerned been at pains to push forward the operations with a suitable alacrity. This discovers a blameable inattention which ought to be corrected. Justice requires, that if individuals are to be accommodated, the public should be as little incommoded on their account as circumstances will admit, and also that individuals should pay for that accommodation. On these principles I beg leave to suggest the following proposal, as likely to effect all these purposes in a fair and equitable manner.

Let it be ordained, then, that every individual who obtains such an accommodation shall pay a sum proportioned to the extent of accommodation he receives, to be applied for the use of the poor. This payment should be as moderate as possible at the beginning; but to augment at the end of each week, in order that it may operate as a stimulus to activity and spirited exertions, to have the evil continued as short a time as possible; and that it may produce its full effect, the augmentation ought to be greater in proportion to the length of time it is suffered to continue. Thus would this kind of tax fall very lightly upon those who exerted themselves properly, but very heavily upon those who, through indolence or inattention, suffered the public to be unnecessarily incommoded on their account.

Upon these principles, let us by way of illustration suppose, that it would be a fair price to charge for the first week at the rate of two shillings and six-pence for each foot that such temporary barricade encroached on the street, and three-pence for each foot in length (or any other sums that shall be judged more adequate for this purpose). In this case, suppose the encroach-

ment on the street to be five feet in breadth, and the front of the house to extend thirty feet, this would be five times two shillings and six-pence, or twelve shillings and six-pence, and three times thirty, or ninety pence (seven shillings and six-pence) which is in all twenty shillings for the first week. This is such a moderate sum as could be attended with no inconvenience to any one. Let the rate for the second week be double to that of the first, which would be two pound; the third week to be double to that of the second, or four pound; the fourth week to be eight pound; the fifth week sixteen pound; the sixth thirty-two; the seventh sixty-four; and so on, doubling the sum each week that it was to continue. This could prove no serious grievance to any one, for very few cases can occur, in which, if the parties are alert, and exert themselves with energy, every thing that requires to be done under the protection of such a screen might not be completely effected in two, or at most in three weeks; in either of which cases the tax would be nothing more than a very moderate compensation for the accommodation given by the public. But if men will be negligent in what respects their own concerns, it is very fair that they should pay for that negligence. Were it possible for us in this manner in all cases to make private accommodation and public convenience mutually give way to each other, and to check abuses as in this instance, it appears to me that the affairs of life would go on in the smoothest and best manner that could be wished, and few stumblingblocks would be suffered to obstruct the way of

December 20, 1799.

A SAUNTERER.

Acknowledgments to Correspondents omitted for want of room.

18.

AUGUST 1800.

RECREATIONS

IN

AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 6. VOL. III.

AGRICULTURE.

PRACTICAL REMARKS ON THE MANAGEMENT
OF THE DAIRY, PARTICULARLY IN RESPECT
TO THE OBTAINING OF BUTTER.

[Continued from page 347.]

Part 6th. *On the Dairy, or Milk-house.*

FROM the foregoing general observations on milk, it is necessary that we should proceed to particulars.

No dairy can be managed with profit, unless a place properly adapted for keeping the milk, and for carrying on the different operations of the dairy, be first provided. The necessary requisites of a good milk-

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house are, that it be cool in summer, and warm in winter; so as to preserve a temperature nearly the same throughout the whole year; and that it be dry, so as to admit of being kept clean and sweet at all times. As it is, on most occasions, difficult to contrive a place within the dwelling-house that can possess all these requisites, I would advise, that a separate building should be always erected, which, upon the plan that I shall now describe, may, in every situation, be reared at a very small expence, and will answer this purpose much better than any of those expensive structures which I have seen, that were built by noblemen or gentlemen for this particular use.

The structure ought, if possible, to be erected near to a cool spring, or running water where that conveniency can be commanded; if this last, the water should be so conducted, if the nature of the ground will admit of it, as to have a small stream brought from the rill to be made run through the house; and, if it can be introduced by means of a pipe to fall from as great a height above the floor as can conveniently be done, it will be productive of many advantages, but in none so much as in keeping up a perpetual freshness and sweetness of the air, in consequence of the perpetual ventilation that this will ensure.

It should be so placed, as that no stagnant water should be allowed to remain near it; and so as that the access to it for the cows should be as easy as possible. A trough through which the stream of water flows should be also provided near it for the cows to

drink out of; and if no spreading trees be there to afford a natural shade, an artificial shade ought to be erected, under which the cows at all times may be able to find a comfortable shelter.

The whole of this structure should consist of a range of narrow buildings, as in the plan annexed to this article, that division in the middle, marked A, being the milk-house properly so called. My original idea was, that the walls of this building should be brick in the inside, lined on the outside with a thick wall of sod all round, and covered with a very thick thatch, for the purpose of obstructing the passage either of heat or cold, which might indeed be done in this way very effectually; but I am now satisfied, that the same object will be attained at much less expence, and with the addition of many conveniencies, by means of a double wall all round, on the principle already explained, Vol. I. page 210, for the purpose of cooling houses in hot climates; to which place I beg leave to refer the reader for the rationale of this mode of building. The inside wall should be reared of brick or lath, double plastered on both sides; the outside wall may be lath plastered. The entry to the dairy should be from the north at B, but another communication should also be through the door *f* into the anti-room, which will be convenient on many occasions, and particularly so in winter, when the outward door B may be kept continually shut. The outward roof should be made of good slate, or tiles, the inner roof of plaster made very close. These two roofs should also have a vacant space between them for the circulation of air, as in

Fig. 2, which represents a section of it, in which A represents the inside of the milk-house, B B the open area between the walls all round. This space diminishes gradually towards the top, till it at last terminates in the wooden chimney *d*, which is intended to serve the purposes of a ventilator, and should be carried to the height of six or eight feet at least above the roof. Through this tube that portion of air that is heated through the outer wall when the sun acts upon it will be instantly carried off, so as never to affect the temperature of the inner wall. A valve, that shuts quite close at pleasure, is placed at *i*, which, when let down, prevents the escape of any air, and thus interrupts at will that escape of heated air just now mentioned. The top of this ventilator is covered by means of some boards in the form of a roof, which throws off the rain without interrupting the current of air. There is also an opening from the apex of the inner house communicating with that tube, through which any particles of air that may chance to be there heated by accident will be at liberty to fly off as soon as it is generated. This tube also is furnished with a valve, which can be closed at pleasure. The floor of the milk-house is raised one step higher than the outside earth, which is on a level with the floor of the vacant area all round; by which means the cold air that may be precipitated during the cool weather in winter will be at liberty to flow off without affecting the temperature within.

To give light to the milk-house, a window is placed along the slant of the inside roof at *c*, that looks to-

ward the north for as great a distance as shall be judged necessary. The glass in this window is put tied close down, nor does it admit of being opened; on the slant of the outside roof at *g*, exactly over it, is placed another window, with the glass also puttied quite close down, so as to admit of light passing freely, without occasioning any interruption of the air between the two glasses. I do not suppose that the sun acting upon this window, either in the morning or evening, could have any sensible effect in altering the temperature of this apartment; but if it should, it would be easy to rear a skreen on the outside to the east and west of the window, which should effectually prevent the rays of the sun from ever falling on the inside of that structure.

The passage round the milk-house should communicate with the external air below only at one place, and that to the north; and this will naturally be at the threshold of the door *B*. Four openings may be made into the milk-house, about a foot from the floor, one on each side, for the purpose of ventilating it occasionally: each of these should have a cover, by which they can be closely shut at pleasure; and within that should be stretched a piece of thin gauze, to prevent access to insects or vermin of any sort by that means. If the valve at the top be occasionally opened when the sun shines bright, it will occasion a circulation of air from below upward, which will carry off any damp vapour whenever that shall appear; but this should only be done when the confined smell indicates that such a thing is necessary. In winter, the venti-

lation ought to be effected by means that shall be afterwards described, or by a heated body introduced into the house itself for that purpose. The whole of the apartment within should be finished off with hard plaster neatly smoothed, without any kind of ornament, so as to admit of being easily cleaned as occasion may require. It should not be painted with oil, but may be laid over with common whitening diluted with butter-milk, which answers the purpose of size without having any smell. It may easily be tinged with any colour that suits the taste of the owner; and this kind of paint is so cheap, as to admit of being easily renewed as often as shall be deemed necessary.

In the middle should be placed a large flat stone (marble if the owner chooses to be at that expence, but good free-stone will answer the purpose equally well), three feet wide at the least, and of a length to suit the size of the apartment: this should rest upon pedestals that would support it to the height of about two feet and a half. Beneath this should be a trough of stone, the bottom of which should be nearly level with the threshold of the outer door, and the edges of which all round, six inches broad, rise six inches above the level of the floor of the milk-house; so that, when filled with water, it would be about one foot in depth. From the bottom of this should run a pipe, to admit of its being emptied at pleasure; and if it be supplied by a current of running water, a place should be made at one side a little lower than the rest where the water can run over, and be carried quite out of the house. The rest of the pavement should be of

stone neatly laid. Round the sides also, at a convenient height, should be placed shelves for the milk-pans: these, where stone can be easily had, will be best made of that material also; but where that cannot be easily procured, wooden shelves will do very well.

Nothing is more prejudicial in a dairy than a damp confined air, which soon becomes infected with an acid taint that greatly affects the taste of all its products. This is a circumstance, then, that ought to be specially guarded against. It was chiefly with this view that the pipe in the form of a chimney was contrived for this building, the structure and operation of which requires to be here particularly explained.

This pipe may be made on three sides of wood lined with plaster, for the sake of closeness; the fourth side, which should front the south, should be of glass closely puttied, so as to be air-tight. The dimensions may be at pleasure, from one to two feet of internal diameter; the wider from east to west the more forcible. Its height also may be more or less, but not under six feet; the longer the more powerful its effects will be. It should have one valve at top immediately under the air-holes, as at *i*, which can be shut at pleasure, and another valve at the bottom at *k*, which can also be closed or not, as circumstances shall indicate. The lower pipe opens into the milk-house, and is of smaller dimensions than the higher pipe. The opening at one side *m* is closed; at *n* is a valve, which, when shut, cuts off all communication between this pipe and the external area. By means of

these valves the operations of the ventilator can be regulated at pleasure.

When the sun shines it acts through the glass with freedom upon the *inside* of the tube along its whole length, and consequently heats and rarefies the air in it, which gives it a tendency to ascend, with a velocity that will be in proportion to the heat of the sun acting at the time, and the height of the tube conjoined. If the valve at *i* be open, this heated air will fly off through the air-holes at top, and of course a draught of air from below must then take place. If the milk-house requires to be ventilated, the valve *k* is lifted up, while at the same time the valve *n* is closed. The whole of the air that is necessary to supply the current in the pipe, must then of course be drawn from the milk-house only; and thus it may be completely ventilated at pleasure. When the valve *k* is let down, and the valves *n* opened, the ventilation will take place only in the external area. If the valves *k* and *n* are both closed at the same time, no ventilation can take place below: but in that case, to supply the current, a hole left for that purpose towards the bottom of the tube should be opened, to supply the waste from the external air. If that hole be opened, while either of the valves are also up, it will tend only to diminish the suction from below; and if the air-holes below be stopped up in whole or in part, the ventilation below may be entirely stopped, or moderated to whatever degree shall be judged requisite.

In summer it would be convenient in general to have the valve *n*, and the air-hole of the pipe both

open, and the valve *k* shut, unless occasionally, when a ventilation was required; thus to allow the air that is heated in the inside of the south passage wall to escape.

In winter, however, the valve *n* should be in general closed; so as to prevent the air that was thus heated in the passages by the action of the sun, from being carried off. It would thus tend to diminish the cold in that area. The valve *i* should also, during the whole of that season, be kept close shut, unless extraordinary circumstances should render it necessary to open it; and the air-hole at the bottom of the pipe should be then also closed, while the valve *k* should be left open. In this state of things, the air that is heated by the sun in the inside of the pipe, and thus rarefied, would expand itself downwards, being forced through the opening *k*, and of course would tend to moderate the cold in the milk-house. All this is so plain, that farther illustrations are unnecessary.

I shall just, however, stop to observe, that by a contrivance of this sort, prisons, and damp confined cellars might admit of being completely ventilated at a very trifling expence. For these purposes the ventilating pipe might be carried up on the outside of the south wall of the house, and attached to it so as to admit of being made of a considerable breadth and length, and consequently of great power, without being liable to accidents from wind; and, though the place to be ventilated were above the level of the bottom of this pipe, it would be of no consequence, or however distant from it, if a communication was made from the bot-

tom of the ventilator into the apartment by means of a close pipe; nor would it signify in this case how much it was bended, to get clear of intervening objects.

Every person who bestows the least attention to this subject will easily perceive, that by means of this contrivance the warmth of apartments in many situations might be greatly augmented in winter without any expence of fuel, and their coolness in summer promoted without any expences: not only so, but even with the acquisition of additional conveniencies. For example: let the whole south part of the house (no matter whether there be any window in that side or not) be covered with glafs, at any convenient distance from the wall, closely puttied in every part so as to exclude all air, unless by the openings placed as above specified. In winter, when the sun acts, the valve *i* being closed, the air between the glafs and the wall must soon be strongly heated, and greatly expanded; and if passages by means of an air-pipe were made from thence into the apartments, that could be opened or shut at pleasure, that heated air might be forced into such of the apartments as the owner chose. The higher apartments could of course admit of being thus heated to the greatest degree; but were floors thrown across the ventilator at different heights, those below, above the ground floor, might be also thus heated in a lesfer degree, and ventilation in summer could be proportionally obtained. While this glafs case was thus performing these beneficial functions, it might be employed with the happiest effect as a vinery, so as thus to do

more than repay all the cost of the glass. But I must not here stop to enter into farther details.

Perhaps the simplest, and therefore the best kind of valve for purposes of this sort may be thus made. Let the aperture be in the first place closed by a firm board placed horizontally, make a perforation in this board, say of two inches diameter; paste a piece of cloth, from half an inch to an inch in breadth, round its upper edges; provide a piece of round tile of considerable thickness, about four inches in diameter, smooth and flat on the under side, and rising into a point above in the middle, having a small hole pierced through that top horizontally for receiving a wire for fastening it; paste a piece of cloth over the under side of this cover; fasten the top to one end of a small lever that is supported on a rest rising from the bottom board; to the other end of the lever fix a wire that passes through a small hole in the bottom board left for that purpose (and if this hole be also covered with a cloth, through which the wire passes, it will be sufficiently close for this purpose). The bottom of the wire may be fixed to a hook when the valve is to be opened, and let hang loose when it is dropped down.

N. B. The opening between the two roofs needs not be more than one foot, although that between the walls were four or six.

The passage around the milk-house, which ought to be at least four feet wide, should answer the purpose of an apartment for keeping butter or other things that require to be kept cool; it should have no windows or other openings into it externally, but should

be enlightened from the inner apartment by a glazed window in each side of the milk-house, made perfectly close every way, so as to admit light only, without any communication of air. The walls of these passages on every side should be done over with plaster worked as smooth as possible. This plaster also should be extended over the inside of the roof, and the outside of the inner roof, so as to make it perfectly air-tight if possible, towards the upper part especially. The plaster, therefore, should have a double coat, and be worked carefully, so as to fill up all the cracks that occur in drying. Still more effectually to close up any accidental fissure that may take place, the whole should be covered with paper neatly pasted upon it, and care be taken to examine it from time to time, to observe whether any rents have taken place, and to close them. The use of these precautions will be explained hereafter.

In situations near a large town, where ice could be sold in summer, it would prove a great accommodation to the dairy-owner to make an ice-house adjoining to his dairy, as at C. This should be surrounded by a double wall on three sides, with an interval between them, like the dairy. The roof also should be formed after the same fashion, only no window would be here necessary. The place for holding the ice should be formed of upright posts, as represented by the dotted lines, lined with wattled work of wands, or close rail-work, leaving a walk all round of two feet and a half wide, round which should be formed a gutter for carrying off any water that dropped from the

ice. This is, indeed, the cheapest and easiest way that could be contrived for making an ice-house in any situation; and a much better mode of making cellars than that of vaults below ground, which are not only more liable to be damp, and subject to mould and rottenness, but also are much more expensive, and not better calculated to preserve a gentle coolness and equal temperature at all seasons.

The apartment marked D is intended to serve as a repository for the utensils of the dairy, and a place in which they may be cleaned and put into order, to be ready when they are wanted. For this purpose, ranges of shelves may be placed round the walls, and tables and other conveniencies where necessary. The door should open from the south, where the roof projects about two feet over the wall, for a purpose that will be explained. At one end *h* is a fire-place, on which should be fixed a cauldron of a proper size for the purpose of the dairy. At *f* is a door leading directly into the dairy, which might be employed occasionally in summer, but should be used as the only entry to it in winter, during which season the door B should be kept constantly shut.

[If cheese be the object of the dairy, an additional building will be necessary, constructed in a different manner, which I do not here specify.]

The intention of all these contrivances, it will easily appear, is, to enable the attentive owner of a dairy to keep his milk in a proper degree of temperature both during the summer and the winter season, and to carry on all the necessary operations of the dairy with-

out much trouble or expence to himself. This equality of temperature in the milk-house is of very material importance, as any considerable variation in the degree of heat tends greatly to derange his operations, and to diminish the value of the products of the dairy. If the heat be too great, the milk suddenly coagulates, without admitting of any separation of the cream; and it is so quickly turned sour, as greatly to mar every operation. If, on the other hand, the milk be exposed to too cold a temperature, the cream separates from it slowly, and, with difficulty, it acquires a bitter and disagreeable taste, the butter can scarcely be made to come at all, and when it is obtained it is so pale in the colour, so small in quantity, of such a hard and brittle consistence, so poor to the taste, and of so little value in all respects, as to bring a very low price at the market, compared to what it would have produced had it been preserved in a proper degree of warmth. To avoid, therefore, as much as possible both these extremes, the milk-house, properly so called, is placed here in the centre of the building, into which there is no access directly from the open air; an open area is left all round it, because it is found that air, under proper regulations, is a very bad conductor of heat or cold, so that a long continuance of either hot or cold weather would have no sensible effect in altering the temperature of this chamber; and if at any time it should acquire a small degree of heat or cold more than was desirable, this, if it were corrected by artificial means, would retain that artificial temperature for a long time. These are the advantages proposed

to be gained by this cheap and simple mode of-construction.

Experiments have not yet been made, to ascertain with the requisite accuracy the precise degree of heat that is the most favourable for the different operations of the dairy. From the trials that I have made myself, I have reason to believe, that when the heat is from 50 to 55 degrees on Fahrenheit's thermometer, the separation of the cream from milk, which is the most important operation in the dairy, goes forward with the greatest regularity. I am, therefore, inclined to think, that this is the temperature which ought to be aimed at in the dairy; but I do not here pretend to decide with a dogmatic precision; a considerable degree of latitude, in this respect, may perhaps be allowable; but from the best observations I have been able to make, it seems to me highly probable, that when the heat exceeds 60 degrees, the operations become difficult, and are liable to many derangements, and when it falls below the 40th degree, they can scarcely be carried on with economy or propriety. Till farther experiments, therefore, shall ascertain this point, we may take it as a safe rule, that the heat should be kept at all times, if possible, between the 50th and 55th degrees; and to ascertain this point, a thermometer graduated by Fahrenheit's scale should be suspended perpetually near the middle of the milk-house, to give notice to the owner of any alteration of the temperature that might affect his interest. Luckily, it happens, that this is very nearly the temperature which a building so well secured as this is from the external air would naturally bear at all seasons of the

year in this climate, were it not to be affected by extraneous objects.

But as the heat of new drawn milk, if it were brought in considerable quantities into so small a place during the summer season, would tend during that time to affect the temperature there, it is not at all impossible but it might thus be raised on some occasions to a higher degree than was proper. It was with a view to moderate this, that I have recommended to have a stream of running water made to pass through the house, to be received into the trough provided for that purpose, on the edges of which the creaming dishes might be placed for a few hours when first brought into the house, the more quickly to deprive them of their heat; or should that not prove, on some occasions, entirely sufficient, the dishes might even be plunged directly into the bason itself among the water. It was also with a view to this circumstance, and especially where running water cannot be commanded, that I wished to have an ice-house conjoined with the dairy, because a small quantity of ice placed in the milk-house at any time would quickly moderate the heat to a proper degree, for this purpose the ice should be suspended pretty high. In the small chambers near the ice-house, too, or in the passage round the ice, the butter, after it was made, and before it was carried to market, could be kept cooler than even in the milk-house itself. Other advantages that would be derived from this additional building will appear obvious.

In the construction of this house, greater attention

has been bestowed to the preservation of a proper degree of coolness during summer, than to the guarding against cold in winter, because it is during the summer season that the principal operations of the dairy are carried on.

PLAN OF THE DAIRY AND ITS APPURTENANCES.

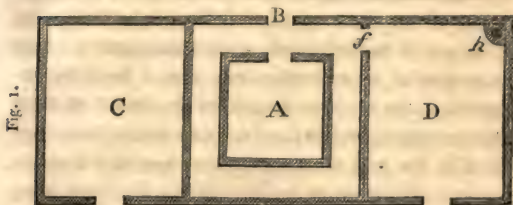


Fig. 1.

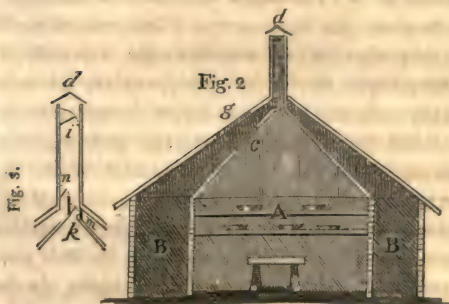


Fig. 2

Fig. 3.

FIG. 1. EXPLANATIONS.

- A. The Dairy in the centre surrounded by open passages. B. The entry to ditto from the north. C. The ice-house. D. The scullery, or wash-house, with the door from the south, and benches placed under. f. Door communicating with the milk-house, &c. A. Fire-place.

FIG. 2. ELEVATION.

- A. The milk-house. B B. Passages round it. c. The interior window, with the exterior window g over it. d. The ventilator, or air-pipe. g. The exterior window.

FIG. 3. THE VENTILATOR.

- i. Valve at the top. k. Ditto at bottom communicating with the milk-house. n. Ditto with the passage.

The attention to the winter temperature, however, has not been wholly disregarded. It was with that view that the walls of the exterior gallery were made so close, and the communication with the ventilator at top directed to be so carefully cut off by means of the air-tight valve: for this, by preventing the escape of the air that is heated by the action of the sun through the wall, acts in a manner directly the reverse of what it does in summer, by instantly permitting the air thus heated to be carried off into the atmosphere, and to have its place immediately occupied by the cool air; thus does the sun itself become an agent for producing cold at one season, and heat at another, so as to preserve an equality of temperature throughout the whole year. The stream of running water, where it can be commanded, especially if that comes from a contiguous spring, tends to co-operate in the same manner, as its natural temperature is much below the summer's heat, and greatly above the summer's cold. For augmenting these effects, it will be well to open the doors into the surrounding gallery as seldom as possible during severe weather in winter; nor can this be inconvenient, as little can be wanted there during that season. The milk-house itself, during the inclement season, should be always entered through the anti-room.

Had it been necessary, however, to make as much use of the milk-house in winter as in summer, still more efficacious means might have been easily devised for guarding against cold. The fire-place might have been made near to that end of the house, from which a flue might have been led, for the admission of heated air, as circumstances might have required;

but as this, under injudicious management, might have done harm, it has been judged more expedient to remove that temptation out of the way. By the contrivances already specified, the bad effects of the severest cold that occurs in ordinary seasons will be sufficiently obviated; and in case of an accidental occurrence of extreme inclemency of weather while the dairy is employed, which can seldom happen, recourse may be had to extraordinary cures. This could be easily done by placing upon the table, on these occasions, a barrel filled with boiling water, closely bunged up, which would emit a gentle warmth all round, that in this close place would preserve a genial temperature for a long time; or a parcel of bricks heated in the fire, and suffered to cool here, would produce a similar effect. These are simple remedies that are always in our power, to which we can have recourse whenever they are wanted, and thus, without any expensive apparatus, free ourselves from the danger of casual emergencies. This I should greatly prefer to complicated stoves, and registers liable to be deranged through neglect, in every case of this sort, where they are so seldom wanted, as never to render the use of them perfectly familiar to those who are to be entrusted with the regulation of them.

The next objects that demand our attention are, the utensils of the dairy; a subject seemingly of a trifling nature, but which is, however, of no small importance to those who hope to derive profit from this branch of rural economy. But this shall be deferred till another occasion.

[*To be continued.*]

NATURAL HISTORY.

ON THE TRANSFORMATION, &c. OF INSECTS.

[Continued from page 358.]

On the Metamorphoses and Manners of the Cock-chaffer Fly, the Scarabæus Melolontha, Lin.; with Hints tending to lead towards some Means of destroying it.

Figure 1.



Figure 2.



WE have already had occasion to take notice of the diversity of forms and habitudes that the larvæ of winged insects assume, which are, in all cases, extremely different from those of the parent fly. We

have seen examples of some of those larvæ that live as aquatic insects for years together, which, in their imago or perfect state, are killed in one moment if immersed in that element. Some of these larvæ are voracious to an astonishing degree, and commit inconceivable ravages on the products of the fields, which in their winged state do no harm to any object in nature, only sporting for a short time in amorous dalliance, and then expiring, without having tasted food. Others are alike destructive in their larva and perfect state; among which class is to be placed the object of our present memoir.

This scarabeus is so well known in England by the common name of cock-chaffer, that a particular description of it is not necessary; and becomes, indeed, the less so on account of the figure of it which we have annexed, in its larva, and perfect state; so that it may be recognised by the most careless observer. Its eggs are deposited by the mother in the ground, from each of which proceeds, after a short time, a small whitish worm with six feet, that is destined to live in the earth under that form for the space of four years, and there undergo all its changes, until it finally assumes its pupa form; subsisting, during its abode in the earth, upon the roots of trees and other plants that grow in the soil, committing ravages among these crops, on some occasions, of the most deplorable kind, so as totally to disappoint the best-founded hopes of the agriculturist: and after it assumes its winged state, it devours the leaves of trees and other plants with an avidity not much less than that of the locust; so that, in certain seasons, and in par-

ticular districts, they become an oppressive scourge, that produces much misery among the people. Fortunately, these ravages are but temporary and local, being moderated by circumstances in nature with which we are as yet in a great measure unacquainted.

As the name of *fly* is indiscriminately bestowed by the uninformed part of mankind as a generic term including all winged insects; so the term *grub* has been adopted as a general name to denote all the worm-like larvæ that take up their residence in the earth; *maggot* to denote those that live in the interior of fruits, and in animal substances; and those are called *caterpillars* that subsist chiefly on leaves. It follows, that the larvæ of this insect will rank among the *grubs*, sometimes called *white worms*, to distinguish them more clearly from the earth worm, which, in its form, colour, and other essential qualities, is totally different from all of the grub kind.

I do not find, that this particular species of grub has obtained any specific English name; though in France, where its ravages, it would appear, are much more frequent than with us, the grubs are usually called *mans*; sometimes also *mulots*, *chevrettes*, *tacs*, *munts*, *turcs*, *vers blanc*, &c.; and the flies *hannetons*, in some provinces *barbottes*, *bardoises*, &c. As soon as the worm issues from the egg, it seizes upon such roots as it finds nearest to it, and devours them, living all the summer under the thin coat of vegetable mould near the surface; but, as winter approaches, it descends deeper into the earth, and, penetrating directly downwards, retires beyond the reach of the frost, where it remains in an inactive state, and

without food, till the return of spring, when the warmth of the season invites it to ascend and begin its ravages anew upon the roots that spread themselves through the tender mould near the surface. In this manner it proceeds for three or five successive seasons, changing its skin at least once a year. It is not till the end of the fourth year that the larvæ are metamorphosed; for then, towards the end of autumn, they go deep into the earth, sometimes to the depth of a fathom, and there spin themselves a smooth case, in which, after quitting their last skin, they change into the pupa or chrysalis. The pupa remains under this form all winter, till the month of February, when it comes out a perfect scarabeus, soft and white. It is not till the month of May, however, that the parts become hardened: they come out of the earth in the day-time; and thus we often find in the earth perfect cock-chaffer flies; which has made many persons think, that these insects live from one year to another, and pass the winter in the earth to protect them from the cold.

These worms, though they are always white, yet are sometimes found verging, more or less, wholly, or in part, into a bluish tint, which has given rise to a popular notion in Sweden, that the nature of the ensuing season may be discovered from the kind of tint that these worms assume. Hence they have obtained the vulgar name of *bemærkelse-mask*, or prognostic-worm, because these people imagine that they can see by them whether the winter will be lasting or not, or whether it will be interrupted by great thaws. It is the different colours of the larvæ that they think

serve as a prognostic in this case; but this bluish tint, wherever it does appear, is only produced by the internal parts seen through the transparent skin, and are nothing more than the intestines and the aliment contained in them, which will, of course, be different according to the nature of the aliment on which they have lately subsisted. However, when these simple people see much blue, they say that the winter will be mild; when the anterior part is white, and the hinder part blue, they think the cold will be more intense at the commencement of the winter than afterwards; and so on of the rest: but these are only tales fitted to amuse the lower classes of the people.

These scarabei are seen during the whole summer, especially towards the end of May, and in June, flying in the evening towards sun-set, particularly where there are trees. They seem to be a heedless kind of animal, that fly briskly without regarding much where they go, and therefore become extremely troublesome to persons who walk in places that they frequent, by their darting frequently, and with force, upon the face and other parts of the body, which, where naked, proves very teasing. They eat the leaves of most species of trees, such as the oak, the lime, the beech, and the willow, as well as all sorts of fruit trees; so that where they multiply fast they make terrible havoc; which happens but too often in France and other countries of Europe.

In the United Provinces of the Low Countries, the children amuse themselves by attaching a long thread to one of the hinder feet, and leave them thus to fly without suffering them to escape; they fly then com-

monly round, describing a circle in the air; from which some think they have obtained the name of *molinaars*, that is to say, millers: the probability is, however, that they have obtained that name from the greyish hairs, resembling powder on a slight look, with which their bodies are covered all over; for we find they are, in some parts of England, called millers, where no such practice is known. The children of the country of the Netherlands make a little trade of them, by selling them to the children of the city, who have not an opportunity of searching for them themselves; and M. de Geer, from whom this little anecdote is taken, says, that he himself, when a boy, purchased many of them.

Such are the particulars that have hitherto come to my knowledge respecting this noxious insect; which, considering the important part that it performs in this universe, are fewer than might have been expected. In the year 1785 the following provinces in France, viz. Burgundy, Champagne, Picardie, L'Angumois, Hainault, L'Orleannois, Bl. sois, and particularly the Isle of France, suffered prodigious distress from the extensive ravages of this insect, insomuch that the attention of government was called to that subject, and premiums were offered to any person who should suggest the most effectual means of destroying it; but their premiums were offered in vain. A memoir, indeed, was produced by a Mr. Adam, Emeritus professor in the university of Caen, which gave an exact description of the insect, and proposed some measures for destroying it. This pamphlet was printed and distributed, at the expence of government, through all

the provinces; but when it was put into the hands of practical agriculturalists, it was found, like too many speculations of literary men, to be wholly incapable of being reduced to practice, and was, therefore, disregarded. The Society of Arts in London also has, for about twenty years past, held forth a premium for the best account of this insect, and the means of checking its ravages, but without having produced one successful claimant. This indicates a wonderful degree of inattention, among professed naturalists, to the most important department of natural history, viz. that which, by developing the natural propensities of the different objects, tends to the diminution of the evils that they produce, and augmenting the benefits that might be derived from them. But, though success has not hitherto attended these exertions, it ought not to produce despondency. *Plus ultra*; let us still try to go forward; by a lucky chance we may, perhaps, be enabled to make some progress. If we give over the effort, we must inevitably be doomed never to advance. Let me, then, beseech my readers to rouse themselves from the slumbers in which they have too long indulged, and to exert themselves to rescue the name of *naturalist* from that sort of obloquy which it bears among so great a portion of the practical departments of men, by shewing that it is by their aid chiefly that evils of the nature here stated can be obviated. I know that much may be done, in this and many other departments, by a well-directed attention steadily pursued.

The learned professor, considering that the grubs descend to a great depth during the winter, and return

to the surface mould in the spring, advises, that the ploughing should be deferred till the spring season, when the grubs will be turned up with the furrow, and may then be picked up and carried off the ground. Practical men answer, that ploughing must go forward in the winter while the weather will permit, or the necessary operations will be so much retarded, as to render it impossible for them to get the seed put into the ground in proper time; besides, it is only a very small proportion of those grubs that are in the ploughable mould that could thus be discovered; by far the greater portion being turned over with the mould itself, without being exposed to view; so that this process would be but little efficacious even in ploughed fields. But could these ploughed fields be even thus totally cleared, the evil would only be partially remedied; for the grubs abound in grass fields, perhaps, yet more than in corn lands; also in woodlands, orchards, and vineyards, none of which admit of being treated after this manner; nor can land sown with wheat or rye, which require to be put into the ground in autumn, admit of it: from all these fields, then, as from extensive nurseries, these insects would issue forth in swarms so as to frustrate the labour of the husbandman upon his ploughed fields.

The professor again directs, that boys, and girls, and women, should be hired to pick up the grubs after the plough. Practical men say, that boys and girls will be so careless and inattentive, as to perform the work in a slovenly manner, and let many, even of the few that were turned up, escape; not to mention the expence that would attend this process, and the diffi-

culty, on many occasions, in finding hands, together with the inefficacy of the measure, as above stated, could it be even faithfully performed. From these considerations the learned professor's advice met with little respect among those for whose benefit it was intended.

Some of these practical men observed, that the last part of the process might be much better performed by another set of labourers, who sometimes offered their services without any pay, and were infinitely more alert in the discharge of that duty than either children or women could be, or even philosophers themselves, were they to attempt the task. These are rooks, magpies, jays, and all the varieties of that class of birds, who seem to consider this kind of food as the most delicate morsel they can find, and therefore search for it with the most patient avidity. Some of these birds, indeed, seem to be endowed with the faculty of distinguishing this insect even when it is out of sight, and buried to the depth of several inches in the mould (an instance of which has been given in a former part of this work); which shews, that these animals are not only of greater use than any human being could be in picking up these insects after the plough, but that they can even discover and pick them up in grass land, wood lands, and orchards, wherever they abound. Great care ought then to be taken to cherish and protect these birds; for, as their sole employment, for nearly three months before the corn ripens, is to search for insects of this sort for food, the havoc a numerous flock must make among these insects must be very great. A cautious observer, having

found a nest of five young jays, remarked, that each of these birds, while yet very young, consumed fifteen at least of these full-sized grubs in a day, and of course would require many more of a smaller size; say that, on an average of sizes, they consumed twenty apiece; this, for the five, makes one hundred. Each of the parents consume, say fifty; so that this pair and family consume two hundred every day. This in three months amounts to twenty thousand in one season; but, as the grub continues in that state four seasons, this single pair, with their own family alone, without reckoning their descendants after the first year, would destroy eighty thousand grubs. Let us suppose that the half, viz. forty thousand, are females, and as it is known that they usually lay about two hundred eggs each, it will appear, that no less than eight millions of grubs have been destroyed, or prevented from being hatched, by the labours of this single family of jays. It is by reasoning in this way, that we learn to know of what importance it is to attend to the economy of nature, and to be cautious how we derange it by any of our short-sighted and futile operations.

Not only are there a great diversity of birds who watch the time of these grubs appearing near the surface, with an eye as keen as the fisherman watches the arrival of the shoals of herrings, and which it is our duty to search out and to cherish; but there are, doubtless, many other creatures below ground, did we know them, who search for them in their secret retreats, while they are far beyond the reach of men and birds, and there devour them; for this is an universal law of nature. We are, however, as yet in a

great measure ignorant of the creatures which there prey upon them.

But if a few of these voracious vermin may be killed while yet in their grub state, they may be destroyed in still greater numbers while in their fly state; for they are then in a great measure within the reach of the arm of man himself, who may then seize them without much difficulty, and perhaps on some occasions may convert them even to his own emolument. The natives of those countries where locusts abound go in chase of them to furnish a repast for themselves: it is in our power to apply these scarabæi towards the feeding of our domestic animals, many of which are greedy after them, and thrive upon that food, so as to enable us to be at a considerable expence in procuring them for that purpose without incurring any loss. Thus may we greatly diminish the number of the future progeny without expence; for it ought never to be lost sight of, that for every couple of flies we destroy before they have laid their eggs, we prevent the production of perhaps two hundred grubs: thus shall we prevent rather than cure the evil.

The fly rests in a state of inactive stupor all the day, attached, while in that state, to the under side of the leaves of trees almost of every sort, from which they may be detached by shaking the branches, or beating them with rods, and then swept up from the ground, from whence they do not then attempt to get away, especially towards the middle of the day, which is with them the season of copulation. It has been proposed therefore by Mr. Christian Kleeman, in a memoir on this subject that was crowned by the academy of the Elector Palatine for the year 1763, that in the

seasons when these insects abound, the whole inhabitants of these districts should be called out by the authority of the magistrates as often as can be made convenient, to chase, and destroy them by this means; and in order to ascertain with some degree of precision what may be done in this way, he went by himself a whole day to that employment, and found in the evening that he had killed above a thousand. This number, according to the calculation above given, would prevent the laying of one hundred thousand eggs, and the production of course of nearly the same number of grubs; supposing, then, a hundred thousand persons to be thus employed, they would at the same rate destroy ten thousand millions of grubs; this, if repeated ten times in a year, must soon produce a sensible abatement in the numbers of this destructive vermin. Let not, then, man sit with his hands folded over each other while he beholds the produce of his fields wasted away by secret destroyers, who are then indeed in a great measure beyond his reach. I cannot too often repeat, that it is only by eradicating the seeds of weeds and of insects, that they can ever be effectually overcome. It ought however to be remarked, that this kind of hunting should always commence as early in the season as possible; for, as this fly lives for some time after it has deposited its eggs, should the hunting take place after that period, the principal object aimed at could not be attained.

The bodies of the scarabæi that are thus destroyed, if carried home, afford a most acceptable food to ducks, turkeys, and the other inhabitants of the poultry yard, which are remarked to lay a greater number of eggs when thus fed than at any other time. Swine like-

wise devour them greedily, if they be first bruised and mixed with their other food, and thrive upon them greatly; so that there can be little doubt, but the labour of the day would be abundantly paid for by the fruits of the chace.

Even children and poor persons might be trained to that kind of chace, by purchasing the quantity they brought from day to day at a moderate price, and giving them the money to carry home in their hands. A beneficent Curé near Blois, in France, tried this plan in the year 1785; and, at the price of two liards a hundred, the children of his village in a few days brought to him no less than fourteen thousand. Thus, for the moderate sum of eight livres, thirteen sols, six deniers (about seven shillings and six-pence) he destroyed, according to his calculation, one million four hundred fifty-three thousand seven hundred grubs, which, had they been allowed to be hatched, might in the course of four years have done damage to the amount of many thousand pounds.

I wish to impress my readers with a strong sense of the utility of attending to such considerations as these, because it is merely from the want of such attention that the world has so often suffered by the scourge of these and other vermin. It has been often remarked, that these insects do not prevail to an equal degree every year, but that they only come in immense swarms at accidental times (which no one can account for) and disappear again, perhaps for a considerable period. We content ourselves with looking upon this as an unaccountable phenomenon, and do no more. But is it not certain, that there can be no effect without a cause? And when we observe the ef-

fect, ought we not, if we act like persons endowed with the use of reason, to try to discover the cause? I have stated the above facts to show, that a very great effect may be produced in cases of this sort by a cause that may easily be overlooked; for who could have suspected, at the end of seven years, that such a diminution of the effects produced by this insect on the fields could have been the result of such trifling exertions by a few children at play? A much greater destruction must be produced among these insects by the inclemency of the weather at a particular season; perhaps a heavy thunder shower at a critical season, or a fall of hail, which nobody has adverted to in this light at the time, but the effects of which at many years distance are sensibly felt.

Nor is it by the inclemency of the weather alone that these insects may be swept away, and their progeny cut off for a time in a particular place: an uncommon number of swallows and wagtails, but more especially of bats, or owls, or various other birds that are constantly in search of this kind of *Scarabæus*, may occasion a similar effect. Another *Scarabæus* even, known in France by the name of *Vinaigrieur*, or *Serjent* [What is the Linnæan name?] lives upon the *S. Melolontha*, which it seizes by the side, and in the twinkling of an eye ends its existence. Even cats pursue them with avidity, and eat them in numbers; the absence or presence, then, of such creatures may tend to augment or to diminish the ravages of these insects to a considerable degree, without being at all attended to by us. The conclusion that I wish to draw from these facts is simply this, that the ra-

vages of insects in general, and of this insect in particular, may be much more easily guarded against by the exertions of man than has hitherto been in general believed; and that, would he but attend with care to the natural progress and habitudes of animated nature, especially those of the insect tribe, he might come in time not only to subdue them as an enemy, but even to employ them on many occasions, as he now does some of the larger animals, to add to his gains, and minister to his comforts.

As I do not read the German language myself, and knew that Roesel had given accurate figures of this insect in its different states, I put the above into the hands of a friend who understands German, requesting that he would compare it with what Roesel had said on the same subject, and favour me with his remarks; for I was anxious to be as correct as possible on this very interesting article. The following are the remarks that he sent:

“ There appears to be nothing material in Roesel’s account of the *Scarabæus Melolontha*, or, as he calls it, Earth Beetle (*Erd Kefer*), differing from what you have stated. He had been extremely assiduous in observing the various habits and changes of this insect; and I should suppose, that his discoveries were the first that led to the knowledge that we have of its natural history, as you have represented it. There is one circumstance, however, which, as it led Roesel into error, may be deemed worthy of notice from the danger there is of others falling into the same mistake. There are apparently two kinds of this fly; the one, with the shell or covering of the neck red, which have the

hard point at the tail short and small; the other, with the shell which covers the neck *black*, and the hard point at the tail longer and stronger than the others, some of them having the feet also of a blackish colour. These Roesel thought were two different kinds; but Kleemann, in a treatise which was honoured with the gold prize medal given by the Electoral Academy of Sciences at Manheim in 1770, made it appear, that these were absolutely the same insect, and that the difference was occasioned only by those with black necks being more healthy individuals, from the more favourable soil, climate, or food, that they happened to meet with. Kleemann farther observes, that though Roesel has assigned four years as the regular time which the caterpillars require to complete their growth, it is for the most part five, and that they usually undergo their change in the sixth year. Roesel gives a very particular description of the caterpillar, which it is unnecessary to transcribe, as the annexed figure will supply its place, No. 1 being the representation of a full grown one. The small dots at the ends of each of the vertebræ or joints, except the second, third, and last, are shining specks which are the air-holes through which it breathes. It changes its skin once a year; previous to which it penetrates deep into the earth, and there encloses itself in a smooth, round aperture, which it prepares for that purpose. In the autumn of its fifth or sixth year, when it has completed its growth, it penetrates in like manner into the earth, and prepares itself a similar dwelling; not, as according to Roesel, spinning any sort of web, but in a manner plastering the earth with the juices of its body, so as to

make the cavity hard and smooth. It then assumes the pupa form, in which state it remains till the following spring, when it comes to the surface a fly, as in figure 2.

“ I cannot help making a remark that has occurred to me on glancing at the work of this industrious German (Roesel), namely, that most of the persons in this country who enter on the study of natural history content themselves with the information they meet with in books that are published in other countries, or in former times, and will not give themselves the trouble of investigating facts themselves. This want of industry and exertion is not less conspicuous in the amateurs of any branch of natural history than in those of entomology. There are many gentlemen who will pay great prices to idle fellows for all the *handsome* butterflies they can catch, and some who will themselves spend whole days in the pursuit of such insects, with the same degree of avidity as that with which others will wander along a brook in search of trout, or over the fields with a gun. When they have got their store, they turn over their books, arrange them under their proper classes, genera, and species, and are satisfied; but where is the man that will, like Roesel, watch the progress of an insect for four or five years, taking the greatest care all the while to provide it with such food, and to place it under such circumstances, as will preserve it in health, so as to bring the experiment to a proper issue? There may be such in this country, at present; but I say they are few, and that most of our intelligence on these interesting matters is derived from abroad; being retailed out to

the amateurs among ourselves in various shapes and colourings by ingenious writers, who compile and arrange their materials so as to be easily understood by our *readers* of science. Entomologists will say, "Why so severe on us; are not the botanists equally blameable? They are: but the two sciences, though they ought to be on the same footing in this respect, are very much otherwise. According to the ideas which most people entertain of botany, it is sufficient to understand the descriptions and arrangements of plants as they exist, without minding their history; but I conceive that it is expected of an entomologist, not merely to say what are the particular characteristics as to anatomy, of a fly or a caterpillar, but also to know something of their natural history, of the changes they undergo, and at what periods and intervals. I allow, that botany ought to extend to the same length with regard to plants, and I have no doubt will at some future period; but it has not hitherto. All I now complain of is, that naturalists in general are too easily satisfied with information drawn from the labours of others, and thereby preclude themselves from the power of correcting their errors.

"An acquaintance of mine, who is enthusiastically fond of the study of botany, confessed to me that he never was more at a loss for a reply, than to the question of a child, who asked him one day, when he was eagerly expatiating on the acquisition he had made in procuring a rare, but ugly plant, "what was the use he put the plants to that he gathered?" The science of botany, as it is studied at present, seems to be no other than the discovering of all the species of the ve-

getable kingdom, and investigating their structure, so as to arrange them methodically. The immense numbers of botanical works published in this country, and I may say every where else, at present, appear to be of no other use than merely as books of reference with regard to nomenclature. It is wonderful to what a pitch of ardour and indefatigable industry this study has been and now is pursued by men of real genius, whose talents, if employed in discovering the useful purposes that plants can be applied to, or in any other beneficial pursuit, would be of real advantage to their fellow-creatures——.”

I shall presume, that the importance of the subject will plead my excuse for venturing to suggest a few additional hints, grounded on the facts above stated, tending to direct the reader into a train of investigation that may lead towards some effectual means of diminishing the numbers at least of this destructive insect, if not of eradicating it entirely in some places upon particular occasions, and of pointing out some hitherto unobserved consequences that may have resulted from the natural operations of this singular creature, as well beneficial as hurtful, that may serve to unveil some part of that economy of nature which hath hitherto attracted too small a share of the attention of man.

It has been already remarked, that the ravages of this grub are sometimes not experienced for many years together; while at other times they appear in immense numbers, without our being able to assign any reason for it. This, I conceive, must be owing to the long period that this insect lives in its grub state, during

all which time it cannot multiply, and must be subject to a variety of accidents that may destroy it without ever allowing it to come within the reach of our cognisance. If so, a similar thing ought to be observable with regard to all other long-lived grubs, such as the cicada, locust, &c.; and in fact I find it is so.

This consideration naturally suggests the idea, that our chief efforts should be directed towards the discovery of the means of destroying it while in its grub state; and with that view the following hints are suggested.

We are too little acquainted with the powers and history of the scarabæus that is called by the French *Vinaigrieur*, and other scarabivorous insects, to avail ourselves of their labours; but it is very obvious, that should these, or other insects that feed upon grubs, by any accident, take possession of the soil where the cock-chaffer grub abounds, they must quickly destroy immense numbers of them; and as they have no less than six successive seasons to prey upon them before they arrive at their perfect state, we could not be surprised were the whole race (should they have been even extremely numerous at the beginning) to be there entirely extirpated before one fly should be produced. Did we know, then, the way of propagating these insects, so as to be able to place them in a particular field at pleasure; and were it known that their other operations are not peculiarly hurtful, we should have it in our power to eradicate this destructive grub when we pleased. Where is the man who is ambitious of acquiring a reputation for utility of research? The field lies here open before him; let him proceed.

In the mean while, we ought not to neglect other means that are obviously in our power. It is well known that the whole of the *corvus* and pie tribe are greedy of this insect above all others; and, as if nature intended it for their principal food during that season of the year when grain is scarce (that is, from the end of seed-time till the beginning of harvest), they then search for it with unceasing care, and the most watchful attention. And though there can be no doubt that, in the prosecution of these their daily labours, rooks sometimes themselves do mischief to man, yet there can be little doubt that the damage they thus commit is amply repaid by the benefit that results from these their unceasing labours. Thus, having observed that those plants whose roots are attacked by the grub, appear in the day-time with their leaves drooping and fallen, the whole rook tribe, wherever they see plants that are usually preyed on by grubs in this state, fly to them, dig deep at their roots for the grub with their strong bills, and if they do not thus find it, they pull the plant itself out of the ground, and thus seize upon it. When the grub is there, no harm is thus done; but it often happens, that, mistaking the drooping of the leaves of new-planted plants, for those that have been injured by grubs, they seize upon these, when, finding nothing by plunging their bills into the ground at their roots, they pull up the plants one by one, and thus do great damage to the gardener, if not watched. As the grub is particularly fond of the roots of strawberries, it sometimes happens, that whole fields of strawberry plants are thus pulled out by the rooks immediately after they are

planted; to prevent which, it is necessary to guard them till their leaves assume an upright position.

But if rooks do sometimes a little damage among growing crops in this way, it is trifling, when compared with the great benefit they thus do in picking up these vermin both in grass and corn land; so that great caution ought to be used not to disturb them: and in lands that are fallowed, where grubs abound, they prove infinitely beneficial. Where this is the case, the owner of the field should keep stirring the field with the plough every day that the weather will permit during the period above indicated. If the rooks once find the way thither, they will not abandon the plough without great violence done to them, and at each stirring will destroy innumerable multitudes. These stirrings then should be repeated as often as possible under these circumstances; nor is it by any means certain that these grubs at this season, when food seems to be so peculiarly necessary to them, might not even be starved for want of food by a fallow so conducted as never to allow any plant to establish itself in the soil; were no other benefit to result to the field, the destruction of these insects would amply indemnify the farmer. A fallow, therefore, considered in this point of view, may sometimes be the destruction of a whole race of grubs in that field.

Gardeners, who cannot adopt this compendious method of destroying the grubs, are under the necessity of resorting to other contrivances. Cabbages, cauliflowers, and strawberries, they have remarked, are all much relished by the grub; but, of all the garden plants common with us, the lettuce seems to

be its most favourite food. In land infested with the grub, therefore, they sometimes make use of this as a bait to destroy them. With this view, I have been assured, that it is a common practice to plant a row of lettuce plants between the rows of strawberries. In that case the grub infallibly attacks the lettuce. The careful gardener, aware of this, examines his plants with care each day, going along the rows with a trowel in his hand: wherever he sees the leaves falling, he knows that the enemy is there; he immediately digs it up, and thus destroys the grub. In this manner great numbers of them are sometimes destroyed.

It seems to be highly probable, that the whole race of these grubs may be entirely extirpated in stiff soils by long continued violent rain during the winter season. For at that time, having descended deep into the ground, the passage by which they descended must be in some measure left open, so as to allow the water, if in abundance, to soak down to the bottom of their hole, which in a retentive soil it must then fill, and if long enough continued must infallibly drown the whole. This is a natural process, which, when we are once acquainted with their mode of living, although it never has been hitherto remarked, must frequently have happened. And this suggests an easy method of destroying them by art on grass ground in many situations. Wherever irrigation for other purposes takes place, the destruction of the grub by this method must be effected: and there are many situations where water may be commanded in sufficient quantities for this purpose, though it be too scanty to answer the other intentions of irrigation; for it seems

to be highly probable, that if a stream of water could be spread over the surface of a grafs field only for a few days during any of the winter or spring months, it would be sufficient to drown the grubs in their holes: and, as this is the season when water most abounds, a very small stream, were it often enough shifted, might be made thus to go over a very large tract of ground in one season; nor ought it ever to be forgotten, that the benefit of one irrigation would be felt for six years. I therefore recommend this mode of destroying grubs to the attention of those who have grafs lands which are infested with them, especially when it is intended to turn them up to corn; for it is well known, that the havoc grubs do, in these circumstances, to the first corn crop is often astonishingly great. It might even with safety be applied to orchards and wood-lands; for these would sustain no damage were not the water continued longer than was necessary to effect the destruction of the worm.

One observation more, and I have done with this subject.

It appears very obvious to me, that land may be on some occasions effectually drained, and on others rendered a bog, by the unobserved operations of these insects. Suppose, for example, that beneath the vegetable mould the subsoil consisted of a stratum of retentive clay, such soil will naturally be damp at particular seasons, and stand in need of draining; but if that stratum of clay shall not exceed three or four feet in thickness, below which lies a stratum of sand or other porous substance, it is obvious, that, should this field be taken possession of by a numerous family of

grubs, these, by descending downwards in winter to the depth of five or six feet, would pierce entirely through the clay, and thus would open innumerable small holes, through which the surface water would be suffered to descend, and thus the field would be effectually drained. On the other hand, should the stratum of clay lie above a pervious bed that was filled with water pent in, and should that clay have been formerly impervious to water, these insects, by penetrating that clay in their descent, would open a passage for the water to rise through these small holes, as in the operation of tapping, which, by mixing with the surface mould, would soon convert it into a swaggle; thus may great effects be produced by means seemingly the most inadequate. Who, that considers natural-history under this point of view, will deny that it is an interesting study? It tends to unveil the secrets of nature, and to extend the powers of man far beyond their natural boundaries. I blush to think, that in this walk we are chiefly indebted to the labours of foreigners. My countrymen want not talents for research: why should they not exert them more in this line, so as to come in for their equal share of national praise?

[*To be continued.*]

MISCELLANEOUS LITERATURE.

Lucubrations of Timothy Hairbrain.

THE RECLUSE.

[*Concluded from Vol. II. page 55.*]

MR. EDITOR,

I AM determined that I will not lose the thread of my discourse this time [this alludes to the termination of Mr. Hairbrain's last essay, see Vol. II. p. 55], and therefore shall take care to call in my wavering thoughts and wandering imaginations until the story be completely concluded. I did not think, when it was begun, that it would have run out to such a length; but I am fully determined it shall now be ended. If, after writing this out, it shall seem to me to be too long, I shall draw my pen through some of the least interesting passages, leaving you at full liberty to do with them what to your better judgment shall appear to be most expedient.

“And Thomas went forth, and his dog went with him.” In other words, Thomas, accompanied by his favourite, Diver, led me once more into the garden. The sun now shone very bright; and he conducted me by a walk overhung with shady trees, that led towards the great tower, which was in some measure concealed from our view till we came very near to its base, where the masonry fragments of the wall, interspersed with pyracantha and other shrubs of various kinds, that sprung up in irregular wildness, exhibited a scene, that, for grandeur and picturesque effect, I had seldom seen equalled. The walk was conducted in a devious course among the ruins, behind which it

led into a kind of grotto, or covered passage, at the bottom whereof was a door that opened into a small area of perhaps half an acre in extent, which formed a kind of garden, filled with flowers and shrubs and fruit trees, intermingled in such a manner as to give it an appearance of rich luxuriance, without conveying the idea of trim formality. The walks were occasionally turned aside to avoid opposing obstruction, but without any thing of that serpentine writhe which seems to have been invented for the use of blind men, who may know, after walking a few steps in it, when they ought to turn to the right and when to the left hand again, with as much certainty as the clearest-sighted person could do. The walks here seemed only to turn from the straight course when an object came in the way to force them to do so. In some cases, the trees and shrubs crowding close upon each other rather encroached on the path, which brushed close between them; in other places it widened more, the trees retired backward, and thus formed a sheltered opening, in which the flowers displayed their charms to the greatest advantage. These were scattered as if with a careless hand, and placed so much apart as to admit of their being well seen. Every plant appeared in the highest perfection; and the dark brown mold, new dressed, seen between them, and the lively verdure of the turf in the larger openings, gave to them an appearance of freshness and luxuriance that was highly pleasing. The fruit-trees were all kept low, and seemed to be vigorous and healthy; their boughs bending under a load of fruit, the apples in particular, now glowing with mellow tints that rendered them extremely inviting.

This area had, in early times, formed one of the courts of the castle. On three sides it was bounded by buildings, but was open to the south, the boundary on that side being only a low wall. The large tower stood in the south-west corner. All the buildings round were now in ruins. On the northern part the building rose to the height of three stories, and were overspread at one side by a vine, and on the other by a pear-tree that reached to the top. These trees had been planted by the former owner of the place, and had been trained to the height that I have mentioned under the auspices of the present. All the fruit trees, and most of the shrubs, had been planted by the last owner, who had indeed laid out the garden, which had afforded him great amusement for several of the latter years of his life. "It was some time," said Thomas, "before my master discovered the way to this pleasing spot. During that interval," continued he, "I had been busy, not so much in decorating it and rendering it neat, as in meliorating the soil with a view to render it capable of producing luxuriant plants; in viewing which I well knew my master took great pleasure. Unknown to him, I got it all dug over, richly manured, and put into the nicest order that I could think of. The entry from the garden was at this time choaked up by a quantity of brush-wood, that had been put into it to be out of the way; and the walk that led towards it had been allowed to be overrun with weeds: these," said the provident Thomas, "I took care not to remove until the whole was finished, and the plants had attained their highest degree of beauty. I then had labourers

to remove the rubbish while my master was otherwise engaged, and got the walk that leads to it just so far cleaned as to render it easily passable, without being put into such a state as to be singularly attractive. The door was left upon the latch, to render it easily accessible to him if he should chance to stroll that way. I knew," said he, "that should my master come thus unexpectedly upon this highly-cultivated spot, it would make a strong impression on his mind, and excite a kind of pleasure which might have a good effect in tending to efface, in some degree, those gloomy impressions which so powerfully preyed on his spirits: nor were my expectations entirely disappointed. After he had discovered it, he would sometimes saunter in it for hours together; and as you will observe that the Æolian bower is not far from it, he used to spend a considerable part of his time between the one and the other. I knew that he had, from his infancy, been extremely fond of cultivating beautiful plants, particularly such as grew with much luxuriant elegance; and I spared no pains to obtain such, and so to cultivate them as to favour that luxuriant tendency. He soon began to notice them, and by degrees to trim them up with his own hand, and to make them grow in that easy, unconstrained-like manner, which you will remark characterises the plants now under your eye. Please to observe, that none of the flowers are supported by stiff unbending sticks painted white or green, as you see in many other gardens. The head of that carnation, though it does not trail upon the ground, waves with a playful ease as it is shaken by the breeze, supported by that

slender elastic wand, which strengthens the stalk without being either stiff or clumsy. You can scarcely believe with what pains my master will select these little sticks for the purpose of supporting the plants in a proper manner. Most of the shrubs that you see, though they appear to grow in their native wildness, are brought into that form by some degree of art. If you examine them very closely, you will find little supports placed here and there to strengthen those shoots that are too weak to support themselves; an imperceptible hair sometimes connects a weakly twig at some distance from one that is stronger to give it the support it wants; where the shoots are naturally too close upon each other to admit of the elegance he admires, a few of them are cut out merely to open it a little, without being perceived; but the point of a twig is never curtailed. You see no flowers with naked stems, except where the forms are singularly elegant, as the white lily, or the still more stately and elegant *lilium superbum* (for Thomas was a little of a botanist, and admired the hard names, like many other botanists). It is those plants which assume fine forms, and have beautiful foliage, that he most admires; the flower he considers as comparatively of smaller value. Here," said he, "is a plant that I received three years ago as a valuable present from a Scotch gardener at a gentleman's seat about ten miles from hence; he called it *Thalictrum cornutum*. It is now a prodigious favourite here. I was told that it would grow to a great height, if it were planted in a very rich soil and sheltered situation, and that it assumed a form that was singularly elegant. The

ground, though naturally very good, was richly manured for it; and you see it is placed at such a distance from all other plants, as to have the whole fertility of the soil to itself, and to admit of being well seen, though perfectly sheltered from every wind. The root was a pretty strong one; and the first year it shewed one flower-stem that rose to the height of nearly six feet; but the stem appeared to be weakly; and it was too bare at the roots to give all the satisfaction we wished. The second year, beside one vigorous principal stem, it shewed another that was somewhat more weakly. This weakly stem my master cut close to the ground when it had attained the height of two feet nearly. The principal stem pushed up that year to the height of eight feet; and, being thickened at the bottom by the leaves and shoots that sprung out where the stem was cut, it was then a very beautiful plant. This year, which is the third from the time of planting, it shewed four flower stems, three of which my master cut at different heights and at different periods of growth, which shot out those lesser stems that now give the fine luxuriance of foliage at bottom, from among which the principal stem shoots up with that singular elegance that you behold." It was, indeed, one of the most beautiful plants, thus trained, that I had ever seen. The stem, Thomas assured me, rose to the height of twelve feet nearly; it was smooth, straight, and slender, sending out alternate leaves of great length, beautifully divided into lesser leaflets, somewhat resembling those of the columbine, only more light and open, spreading out in a horizontal position nearly. These leaves were placed at a considerable distance from each other

along the stem, diminishing in size and in distance from each other as they rose towards the top. Under each leaf, as they approached the top, sprung forth a small flowering branch; these branches grew gradually longer as they came nearer the top; each of them dividing into lesser ramifications towards the point on which the flowers were placed. These were of an open umbelliferous kind, carelessly easy and irregular. Each flower consisted of many filaments, forming a tuft like others of this class. The colours were by no means brilliant, but delicate, being a greenish white slightly marked with red. Though it rose to a great height, its proportions were such as, like those of the cowslip, to convey an idea of feminine elegance rather than masculine robustness. I admired its modest beauty as much as honest Thomas seemed to do. "You cannot conceive," said he, "what pleasure my master takes in this little spot, nor how much it has contributed imperceptibly to wean his mind from those gloomy impressions which overpowered him; nor can any but those who have themselves a taste for things of this nature form an adequate idea of the amusement it affords.—It is to the charms of this spot," continued he, "that I almost entirely ascribe the happy change that has been effected on him; for not only has it contributed to make the time glide imperceptibly along, but, by inducing him to take that degree of exercise which is so necessary to health (for unless it be cleaning and rolling the walks, carrying off the weeds, and other drudgery of that sort, he does almost the whole with his own hand), it has tended to exhilarate his spirits. Our fruits also are very good

of their kinds, and he relishes them very much; and I am convinced, that by the aid of these his health is better preserved than could have been done by any kind of medical assistance." I perfectly agreed with Thomas in this sentiment. But I forget that I must make progress.

Having wandered in this little enchanting spot a considerable time, Thomas at length conducted me to an unperceived opening, to which we were led by a narrow path among some filbert-trees, now loaded with abundant fruit, through the ruins of one of the wings of the building, into another area of larger extent, open also to the south and west, but more wild and irregular than the former. The surface was uneven, as it rose in some places to a considerable height, and in others sunk into deep depressions. I knew not at first what to think of it, till, turning short round a tuft of trees that rose up there with a beautiful wildness, I discovered before me the bold features of an ancient stone quarry: from which, it seemed, at some former period, great quantities of stone had been carried away. Out of this quarry, my guide told me, the stone had been taken which served to erect the numerous magnificent buildings about this place; and the irregular tumps that formed those swells in this enclosure had been made by rubbish that had been laid down there in first clearing the quarry. These tumps were now mostly covered with trees of various sorts; and the grass in the hollows between being very rich, and in full verdure, the trees feathered down to the bottom, and towering at the same time aloft to a great height, with their tops spreading wide, were shewn off to the greatest advantage.

Having taken a transient glance at these, we walked instinctively towards the quarry, whose bold features were highly attractive. I found, upon a near approach, that the rock had risen in this place to a considerable height above the adjoining level, forming a kind of ridge, some part of which still remained entire, while another part of it had been scooped out, and now formed a large and deep excavation. The face of the rock presented itself right before us, the top of which was raised much above its original height by having had a large portion of the rubbish laid upon it, at first rather incautiously, so as at a future period to come in the way, and require to be cut into, to get at the stone. This extraneous covering had been cut through about eight feet perpendicular before it reached the rock. The upper stratum was of freestone in thin layers, the whole not exceeding four feet in thickness, which was separated by a solid stratum of clay about three feet in depth from the under rock that consisted of limestone, or, as some would call it, marble, divided also into layers of from twelve to eighteen inches thick, so as to admit of being raised into large blocks of a size extremely convenient for building. This peculiarity in the strata occasioned a singularity in the mode of working the quarry, that became accidentally a source of great beauty.

From the stratum of freestone there issued a copious spring of pure water, which, being collected together into one place, formed a delightful rill, that with a sufficient fall might have nearly served to turn a mill. They had found no spring in working the under quarry; of course it became necessary to prevent this water

from falling into it. With this view, a bed for this rill had been sunk into the clay, along which it was conducted nearly in a horizontal direction till it got clear past the quarry; after which it was suffered to flow in an easy devious course till it reached the bottom. The lower quarry was then sunk nearly in a perpendicular direction along the side of this rill, and seemed to have been worked to the depth of about twenty feet. A level had been driven from the lowest part of the bottom into this lower quarry, seemingly to let off the water that might have there accumulated in the area during the winter. This level cleared about ten feet of the under rock. The bottom had been raised a few inches above that level, by means of the rubbish accumulated in the work, which gradually filled up the cavity behind them, leaving an opening only at the bottom of the rock where the work had been carried on at the time. The cavity thus left formed at one end of this sunk area a spacious pond of great depth now filled with water.

I thought it necessary to be thus particular in the description of this *artificial natural scene*, if you like the expression, that you might be enabled to form some faint idea of that at a distance, which, when viewed in reality, struck me as one of the most singular and beautiful objects I had ever beheld. I wish I had talents to do it justice in the description; but those who cannot walk, you know, must creep.

The mound that rose high above this bold rock was covered with some fine tufted trees, whose branches flung themselves wide over its front. On the one side, in the bottom, sprung up, at a small distance,

from the edge of the water, a stately Babylonian willow, whose boughs, here protected from every blast, discovered a lively freshness of tint, and a lengthened protraction of twigs covered with an exuberance of foliage, that is uncommon even with this fine tree. It seemed to bend like Narcissus over the pool to admire its beautiful image reflected from the waters, and was seen at times gently to move: "Why dost thou awake me, O gale," it seems to say; "I am covered with the drops of heaven?" On the other side, a tufted acacia loaded with its full luxuriance of foliage, still fresh as the dewy rose-bud, though deepened with the grave tints it assumes at this time of the year, formed a most beautiful contrast to the willow. Between these, and just above the rock, a tree of feminine beauty, with whose port I was totally unacquainted, could not fail to attract my notice. Its leaves were small, its twigs delicately slender, its tints soft and cheerful. Contrasted with the manly oak, it seemed a virgin that had as yet scarcely been gazed on by the unhalloved eyes of man. My guide told me, that it was a tree yet rare in this country, that had been planted there by the former owner of this place, who admired it much. He called it a deciduous cypress. Behind this grove, at a little distance, stood some cedars (of Lebanon), some of whose tops only were seen above the willow and the lowest trees; but the depth of shade they afforded to the partial openings that occurred between the stems of the trees in the fore ground, like the base in music, harmonized the whole, and made it all unite in producing one full and great effect.

Such the scene appeared at a small distance, as it first struck me. On approaching nearer, I found, that the water at the bottom of the upper rock was spread out into a beautiful little bason of no great depth; and just under the acacia tree a commodious seat was formed by leaving a part of the rock just high enough and of a commodious depth for that purpose. This little basin was merely an excavation in the bed of clay, which in the deepest place did not exceed two feet, shelving to the edges all round. To render the bottom clean and beautiful, a good many loads of gravel had been spread into it, which consisted of rounded pebbles of various colours and sizes; and, to augment that beauty still more, some small Indian shells, which had been accidentally brought home by Thomas, had been strewed in among the gravel near the edges. As the sun now shone upon this basin, and a gentle wind wrinkled its surface, the various refractions of light which this produced, occasioned a sort of playful undulation on the bottom, which, joined to the reflected shade of the leaves also in motion, gave the whole an appearance of life and cheerfulness, which was still farther heightened by the movements of some of those small fishes that have been imported into this country from China, under the name of gold and silver fishes; which here sported in abundance, every one being distinctly seen because of the limpid purity of the waters.

I had never before seen so many of these beautiful little fishes swimming at freedom in their native element, and therefore was delighted to have an opportunity of observing them: nor was I a little surprised

at seeing the great diversity in their colours and appearance. I had conceived that the gold and silver fishes were of different species, or at least distinct varieties of the same species; but I had now an opportunity of being undeceived in this respect. I found that there were not only gold and silver, but negro fishes also among them, in nearly equal proportions with the gold and silver coloured sorts. I call them *negro* fishes, because the colour more nearly resembles that kind of impure black which is observable in the negro's skin, than any thing else to which I could compare it; though it sometimes verged a little toward the greenish brown. I was assured, that all the three sorts were invariably produced from the same parent; and that when they are young a greater proportion of them are of the negro sort than afterwards, though it was evident that there is little regularity in this respect; for I saw some negroes of great size, and consequently aged, while there appeared both of the gold and silver colour many that had as yet attained only a very small size, and others mottled, part being of one, and part of some other colour. Thomas, however, acknowledged, that he was not himself very well acquainted with the nature of the changes they undergo, and therefore could not speak decisively concerning them. To me, they appeared more to resemble a bed of tulips or carnations, than any thing else; for, although all the varieties consisted of these three colours, either separately or conjoined in various proportions without ever being blended together, yet one colour sometimes predominated so much over the others, and the patches were so infinitely diversified in size and position, that they produced a very great variety of appearances;

some of them singularly bizarre, and others wonderfully beautiful. They all came to pay their respects to us, not, like the fishes of St. Anthony of Padua, to listen to a sermon, but in expectation of finding some of those crumbs of bread which the persons who came there had been used to give them. Thomas was provided for them, and threw in a handful of crumbs that he had brought for that purpose, which occasioned as busy though a more harmless scramble among them than that which is produced by throwing some handfuls of money among a mob of men. Diver looked wistfully at them, and, turning to his master, with a solicitous look and motion of his tail asked permission to go among them, but was checked with a frown of disapprobation.

From the place where we sat, by casting our eyes beyond the precipice that bounded the basin, we had a pleasing view of the larger piece of water below. The willow tree was just before us, the top whereof rose a little above the level on which we sat, and the deepest part of the lake was just before it. The edge of the pond was, of course, darkened to the deepest shade by the crowded foliage of the tree above; and the waving twigs all around were seen with the most beautiful elegance in the reflection of the clear sky, which at this time was of a whitish azure, with a few thin fleecy clouds. I admired it much. But Thomas said, beautiful as it then appeared, it was nothing to what he had often seen it in a serene evening, when the greenish azure, tinted above with a glow of yellow verging into orange, gave a warmth above the shade that was delightful; and still less so than in the morning, when, seen from another point of view, the

reflexes of the dawning light served just to mark the existence of objects which the imagination could pour-tray as realities of the most enchanting kind. I could not help looking at my guide with a sort of astonishment, at hearing remarks made by him that seemed to be so much above the station he occupied. Every moment he rose in my opinion, till I almost idolised him.

We then descended by a sloping passage into the lower excavation, or the area of the quarry, which might be nearly, as I guessed, of one acre extent, and would have formed one of the most perfect gardens I ever saw. Its bottom was not smoothed into a perfect level, yet was not so uneven as to be in any place rugged. Bushes, intermixed sometimes with trees, had established themselves in irregular tufts; and the grass between them was of the richest pile, consisting principally of the Dutch, or white clover, which here prospered in an unusual degree. The edges of the cavity were irregular, the rock in some places jutting forward upon the view, and in others retiring into creeks or cavities, like those formed on a rocky coast, though on a smaller scale; covered in some places with ivy, which hung waving over the rock, giving a wildish sort of gloom; while in other places the rock was bare, or only covered with grass and other native plants.

We walked towards the pool, which I found to be of considerable extent, and swarming with the China fishes to an astonishing degree. It was very shallow toward the edges, but went shelving deeper within, being deep only at the front of the rock. I learned some farther particulars here respecting these fishes, which, as before, followed us as we walked round the

edges, and for the same reason; for danger had not yet taught them to fear man, as none of them were ever in this place destroyed by him. A stream of water now fell into the lake, forming a pleasing kind of cascade, which had been occasioned merely by the letting down a sluice to stop the direct current from the upper canal, and turn it into this channel. This, I was told, was done just so often only as merely to supply the evaporation from its surface, and keep the waters sweet; the water in this basin was hereby rendered much warmer than in that above, and more stagnant; and here these fishes multiplied much faster, and throve better than in the upper basin. They would have multiplied still faster, I was told, if the pool had served as a watering place for many cattle and horses, which were in the practice of wading in it, and filling it with impurities. I never in my life saw a more inviting place for bathing in than this was; nor could I conceive an idea of a more delightful spot in all respects for a garden than this sunk area would have afforded, when the uses that might have been made of that small stream of water was taken into the account, which might have been with little difficulty conducted over every part of it. But I must hasten to a conclusion.

The only domesticated inhabitants of this delightful spot, if the fishes be excluded from that number, were, a small cow, and a rein-deer, which no sooner spied us than they came with alacrity towards us; for in this abode man, when he appeared, came only to augment their comforts, and they rejoiced at his approach. I found it was a practice here, always to have in readiness in the house a quantity of bread, a thin kind

of cake, made of the meal of pease or beans slightly baked, for the purpose of carrying into the garden for the animals there; and never did children seem to take more pleasure in eating gingerbread nuts or sugarplums, when they were occasionally presented to them, than these creatures did in taking the bits of this kind of bread that Thomas offered to them. They seemed to take equal pleasure in being stroked and scratched, for which purpose my guide carried in his pocket a small kind of curry-comb, that seemed to give them much pleasure. What a difference, said I to myself, is there between the enjoyment that one feels in thus augmenting the happiness of the brute creation, and that of pursuing them for the sake of maiming and murdering them, which so many persons follow as an amusement, with a ferocious keenness that can scarcely be resisted, under the name of *rural sports*! What a savage idea is conveyed by that name! The country, which ought to be the abode of innocence and peace, is thus converted into a theatre of the most wanton cruelty; and the name of *sports*, which originally denoted only such amusements as tended to excite a cheerful exhilaration of mind, is applied to describe deeds which cannot be deliberately contemplated without horror. I do not, in all the course of my reading, know a single phrase, that denotes such a woeful perversion of mind as that of *rural sports*. On the Arena of ancient Rome, *games*, if possible more atrocious, were indeed exhibited. But these were confined to the heart of a corrupted city, where nature was in every thing perverted. They did not sully the purity of nature by calling them *rural*. That was a refinement in perversion reserved for future

ages. When we wish to stigmatise these sports we call them *savage*; but savages know nothing such. Man, while in a state of nature, like every other animal, contrives plans for finding the means of subsisting himself; and among these, that of insnaring and destroying animals for his food is one of the most obvious; but this he does in sober seriousness, from necessity; not in wantonness, *for sport*. It is civilised man alone, who has contrived this refinement in brutality. Could the *Nimrods* who delight in these *sports*, or the *Dianas* who put on the male attire to follow this *delicate* amusement—Could they for once only be placed in the situation in which I felt myself in this enchanted spot, their hearts would tell them how far the pleasure of being followed with respect and delight by the native inhabitants of the desert, whose eye expresses blessings, exceeds that of pervading a region where all animated nature flies in dread from the tyrant, and where the only sounds that meet his ears are plaints of widowed love, or cries of maternal tenderness, searching for the young, whose mangled carcase, and still palpitating heart, the monster carries off in triumph. I know a noble lady, not less distinguishable for her amiable qualities as a wife and a mother, than for the elevated rank in society in which she moves with such dignified propriety, who pursues *rural sports* that are much more becoming, by feeding at times the native songsters of her woods with her own hand, which, in those secret recesses wherefrom strangers are excluded, become so tame as to know and follow her wherever she goes. But small is the sphere of her enjoyment;

where others are permitted to enter, their wantonness spreads terror around, and there they fly the destroyer as elsewhere. I must leave you, my good sir, to suppress or to insert this rhapsody as you shall judge proper; but I think, if you had experienced the gratification which I did on that occasion, you would find some difficulty in resolving upon the former.

I had never before seen a rein-deer, and was much gratified by the opportunity of thus examining a creature of which I had heard so much. On inquiry I found, that when the poor old afs died, Thomas observed that the want was sensibly felt by his master; and having discovered, by means of a newspaper, that Brookes, at London, had got a young rein-deer, a person in town was desired to see if he could purchase it. It was bought and transported hither, where under the care of Thomas it thrives very well. He says, it is a mistake to think that the rein-deer moss (*lichen rangiferous*) is necessary for its subsistence in winter: it can do very well without it; for when grafs fails it will eat hay, or brouse upon the leaves and twigs of many evergreens and other trees. In its native regions, indeed, it subsists in winter chiefly on the *lichen rangiferous*; but that is because nothing else can be there found at that season; and this food is indeed then preferred by it to hay or other dried vegetables, because it is more succulent and tender; but it relishes at that season turnips or cabbages, or almost any other succulent food that is occasionally given to the cow, with which it delights to associate.

I had read so often about this valuable domestic, that I viewed it with a pleasure similar to that which

one experiences on being introduced to a valuable character among the human species, whom we had long contemplated at a distance with a respectful veneration as a benefactor to his kind. And when I considered not only the numerous uses to which it is applied while alive, but the important changes that the various parts of which the body consists are made to undergo after its death, and the important offices they then perform to an innocent people, I could not help recollecting the following lines of Ariel in the *Tempest*:

Full fathoms five thy father lies,
 Of his bones are coral made:
 Those are pearls that were his eyes:
 Nothing of him that doth fade,
 But doth suffer a sea-change
 Into something rich and strange.

During the summer, its milk furnishes the daily sustenance of the frugal Laplander, and the cheese is stored for winter provisions. Its horns, an annual crop, are formed into dishes, and utensils of various kinds for family purposes. Its very blood in winter, draining from the animal daily in rotation, furnishes a delicacy of which the natives are glad to avail themselves without being under the necessity of destroying their stock. In winter, it drags its master and the few goods he can carry to market, over immeasurable tracts of pathless snow, with an inconceivable velocity, and brings him soon back with the few commodities he can purchase to his longing family; and, by an instinct peculiarly its own, it can trace under the snow the places where its food lies buried, and dig it up with its feet; thus enabling its owner to perform

with ease long journies, which, without its aid, could never have been achieved by the utmost power of man, by this means rendering habitable immense deserts which otherwise could never have been explored. When the herds increase beyond the degree that convenience requires, they are killed while still fat towards the beginning of winter, and the flesh frozen so as to keep good through the whole season, ekes out their slender meal till the returning spring brings fresh verdure on the fields to furnish milk in its season. The skin in the meantime serves instead of clothes to defend them from the cold; the tripe is converted into small ropes; the sinews serve the purpose of sowing thread; the tallow for a relisher to other food in the kitchen; and their bones for the most elegant parts of furniture and domestic ornaments. When I thought of all these things, I could not help looking upon this little creature as one of the most precious boons that Heaven in its boundless beneficence had conferred upon mankind; and therefore examined it over and over with the most marked attention.

Its character appeared to me to indicate beneficence. I wish to say, that, as when we contemplate the ass an instinctive idea of patience presents itself, and innocence when we view the lamb, and honesty of the ox, so beneficence seemed to be painted on the countenance of this creature. Its eye is mild, but more discriminative than that of the lamb, though less intelligent than that of the elephant. Its motions, though agile, are gentle and delicate, as if afraid of doing an injury; and it attaches itself to man, not

with the officious intrusion of the dog, but with an obsequious attention that expresses, in the most legible characters, whenever its assistance is wanted, "Here I am." *Nunquam non paratus*. Was it my imagination that painted all this? Be it so. I would not lose the soul that suggests such imaginations for all the ill-auguring surmises that the ingenuity of man can suggest.

It is upon the whole, however, rather a diminutive looking creature. Its form is slender, its stature rather lower than that of the fallow deer, and it has nothing of the majestic stateliness of the red deer, which I had an opportunity of so lately admiring. It carries not its horns so proudly aloft; but the palmated antlers covering its brow with such an unusual amplitude gives it a characteristical peculiarity that appeared to me very pleasing. One singularity I could not help taking particular notice of in the conformation of this animal: as it approached us at a kind of trot, I was struck with a noise that it made, somewhat resembling the sound occasioned by castagnets in the hands of a stage dancer. Being curious to know from what it proceeded, I observed, that when it rested its foot upon the ground, the two hoofs on the same foot spread open from each other to a considerable distance, the division between them extending much higher than on any other hoofed animal I had ever observed; so that, when the full weight of the body rested upon one of the fore feet, the points of the hoofs were perhaps two or three inches asunder. The ligaments there seem to be endowed with an extraordinary degree of elasticity; so that the foot never touches the

ground with a hard unyielding knock, but it presses gradually and gently like a carriage upon springs. No sooner is the foot raised from the ground, than the hoofs, in consequence of the elasticity of these members, come together and strike upon each other with considerable force; and, as its motions are quick, it produces that kind of clattering sound which I had remarked. When this conformation of the hoof is adverted to, we cannot help admiring the wisdom and adoring the beneficence of that being who so happily adapted it for the particular purposes it was intended to serve; for the hoof thus opening, and catching the snow between, forms a much broader base than it otherwise would have had, and thus prevents it from sinking in soft snow to too great a depth, which would have been otherwise unavoidable. Let us go to other regions: we shall find the animals inhabiting them formed with a similar adaptation of parts for the functions they were intended to perform: Thus it is, that as knowledge increases, let us turn ourselves whither we will, we shall be forced to cry out, “Wonderful are thy works, O God, in wisdom hast thou made them all!” Forgive, my dear sir, these involuntary rambles. I shall soon have done.

I must not take time to delineate the purling rill (now returned to its proper channel) hopping from step to step in its descent, and whirling round the stones; forming a thousand varying shades upon the bottom; then gliding among the grafs as if to conceal itself; and then looking sportively out, to see if you have lost it; always full of life and sportive cheerfulness. It put me in mind of Virgil’s *me Galatea fu-*

git; for when you would think you had lost it, it comes rustling behind you as if to attract your notice. But I shall become delirious if I dwell longer on these fairy scenes. I must tear myself from the remembrance of them reluctantly, as I did indeed from the reality. When I came to recollect that I must be gone, a heavy damp came across my spirits, and we walked towards the entry—as our first parents, when obliged to leave Paradise,

With wand'ring steps and slow
Through Eden took their solitary way:

Though this paper is long, I have not availed myself of the liberty given by the writer to curtail any part of it.
Editor.

To the Editor of Recreations in Agriculture, &c.

ON THE BENEFITS TO BE DERIVED FROM BEING
BLIND AND DEAF.

SIR,

ALTHOUGH the government of the *passions* still remains one of the most difficult tasks for human skill and power to perform, yet such is the progress we have made in that *perfectibility* which modern philosophers have taught us, that we are fully able to regulate the five *senses*, so as to make them more conducive to the common purposes of life than they have ever yet been. We have them, indeed, so completely under management, that I am surprised the vast discovery has escaped the encomiums of those

who are continually demonstrating, by many other proofs, that the present is a most enlightened age.

If we refer only to the sense of *seeing*, undoubtedly the most valuable of all, we must at once perceive that we have moulded and contrived this so as to answer a great many curious purposes with which our forefathers were unacquainted. It was an ancient prejudice, for example, that a man, made in the usual way, *must see*, whether he will or not, provided he keep his eyes open. Of this prejudice we have wisely got rid, many experiments having completely proved that the opening or shutting of the eyes is nowise connected with the power of seeing *to advantage*; that *seeing* itself is not in all respects and on all occasions absolutely necessary; that it is a power too troublesome to be always exercised, and apt to bring us into so many scrapes and inconveniencies, that it has been found expedient to delegate it to our neighbours; and that upon the whole, in consequence of this transfer of sight, there are very few who will take the trouble to see with their own eyes.

Philosophers tell us that the *eye* is not *sight*, but the *organ* of *sight*, exactly, I presume, as the tongue is not speech, but the organ of it. It is, therefore, a discovery of some importance to have found other uses for our eyes, than the mere vulgar purposes of *seeing*. Hence you will observe that the eye is now employed very much in affairs of gallantry, where it supplies a language the most intelligible now known, the most easily read, and at the same time as secret as the cyphering of state dispatches, and yet so expressive, animated, and energetic, as to produce some very extraor-

dinary effects on the mechanism of society, and the population of nations. Its grammar is very easily learnt, because few words are necessary, and it has no dictionary of definitions, because the meaning and the expression always go hand in hand: for the same reason there are few of these disputes about pronunciation, or the misapplication or misarrangement of words which occasion in our *other* language so many disquisitions on Anglicisms, Scotticisms, and Irishisms. With respect to the utility of this language of the eyes, it is so generally acknowledged, that it would be a waste of ink and paper to enlarge on it. Suffice it to say, that in the early part of life, it appears to be the only proper use to which the eyes ought to be applied.

Another part of our skill in the management of this sense is, that we can assume, when necessary, a proper degree of blindness. And here we have to encounter another prejudice of education, namely, the opinion that every degree of blindness is a misfortune. This we have probably learned from oculists and other medical gentlemen who are unwilling to give up a species of practice that is abundantly lucrative. But whoever is acquainted with the world, whoever “knows men and things,” must be sensible that the power of being blind is in many instances extremely convenient; without it, indeed, man would not be a free agent; he would know neither how to manage a creditor, nor how to get out of the way of a poor relation. Innumerable are the occasions in which our interest is intimately connected with our shutting our eyes against the most obvious and visible objects.

Indeed, on such occasions, the only alternative is to be blind to them, or to our own interest, and where this happens to be the case, it is needless to say which way the decision will lie.

Without such a power of dispensing with the ordinary functions of the eye, that very useful and convenient thing, called *winking*, would be entirely useless, and if it were to be discontinued we should have reason to expect a wonderful change, little short indeed of a revolution in various branches of the magistracy, from his worship at the office, down to the humble guardian of the night, in whom age happily combines to produce a salutary degree of blindness or *winking*. Not less wonderful would be the change in the conduct of the inferior officers of the excise and customs, &c. in those whose business it is to prevent monopolizing combinations, and other conspiracies against the consumers of the necessaries of life. It may, indeed, be suspected that the late discoveries which have been made in the sciences of forestalling and regrating, have been owing to some interruption given to the operation of *winking*, or to some persons taking upon them, contrary to the usual practice, to employ their eyes merely for the purpose of seeing; the consequences of which must be highly prejudicial.

Farther: in the management of this sense we may perceive another advantage, which is usually called *blinking*. This, although much the same in reality with winking, is distinguished from it by being principally used by political orators in debates. They, like others, have found great inconvenience in keeping

the eyes always open, and therefore occasionally experience the most salutary effects from *blinking a question*. But these gentlemen have advanced a step farther in the improvement of this sense, and that is, by acquiring the happy art of *seeing things in different lights*. This seems to depend on a certain mixture of colours as they touch the organ of sight, which is a secret to the majority of the world. How or in what manner the rays of light are managed we know not; but the fact is, that in consequence of such management, black is made to appear white, or white black, at the option of the orator. I hold this to be one of the greatest improvements in modern optics, and if I knew to whom the world was first indebted for the discovery, I would engage to raise a subscription to erect a pillar to his memory, and to have that subscription filled rather sooner than most things of the kind. I shall not, however, expatiate farther on the subject. All history and all controversy abound with instances of the happy consequences of seeing things in different lights, and of seeing them in those different lights at such very short notice, that it seems to be performed with a glance, or, as we say, with a turn of the eye. I ought to mention, however, that in the management of the eye, in general, there is a connexion, though not always visible, between the organ of sight, and the outward and visible signs of property. I have known a sudden accession of wealth, nay, a single turn of a lottery-wheel, make a man in one moment see every thing in so different a light from what he had seen them before, that his neighbours could not believe it was the same man, and used

to perplex themselves with vague notions of his personal identity.

Hitherto, in praising the ingenuity of the age in moulding the senses to many useful and important purposes, beyond the original intentions of nature, I have confined myself to sight only, which unquestionably ranks highest; but the same remarks will apply to the other senses. *Hearing*, for example, is become extremely manageable, and the ears can be opened and shut with as much facility as the eyes, and as little appearance of design or effort. In truth, if a man were to be obliged to hear every thing, merely because he was within reach of the sound, which I am told was the case formerly, we should lose many valuable opportunities of promoting our interest, as well as serving our friends. But, thanks to the ingenuity of man, we may enjoy a commodious *deafness* as well as *blindness*, and apply it to the same useful purposes. Young people, however, are not quite so adroit in the guidance of this talent as I could wish: perhaps they begin too early, and before the senses have acquired that degree of flexibility which denotes "a knowledge of the world." Hence I have known some of them a little *deaf* to their interest, and others extremely *deaf* to advice. In more advanced life, the great art is to know what one should hear, and what not; for, although we are a very talkative nation, and especially in war time, a prodigious quantity of conversation goes on, I am morally certain there are some things said which are not worth hearing. It is a delicate point, indeed, to determine

this in certain cases, and I have rarely found the speaker and hearer exactly of the same opinion.

The art of managing the ear is, in fact, more wonderful than that of the eye, because naturally more out of our reach, and therefore the shutting the ear is rather metaphorical than literal. Yet, notwithstanding, it is equally effectual in producing the most incurable deafness. Of this we have often very striking proofs. Of all noises, the cries of the poor and needy are the loudest, the shrillest, and the most piercing; yet we have lately found men who have become so expert in managing their ears, as no more to hear the cries of a whole nation, than if they were conveyed in a whisper. To such men the silence of thunder and the taciturnity of a tempest must be objects of singular contemplation. What can be louder to common ears than the din of war, the groans of the wounded and dying, and the roaring of the instruments of death; yet we are told of men who have made themselves so exceedingly deaf, as to add “figure to figure, and cypher to cypher, hoping for a new contract from a new armament, and computing the profits of a siege or a tempest.”*

I might now proceed to compliment the age in which I have the honour to live on the improvements in the other senses, in smelling, tasting, and touching; but I presume what I have already advanced will appear applicable in a great degree to these. In *touching* we have attained the perfection of selecting the most proper objects, and some are even so nice that they will not make use of their hands unless they

* Dr. Johnson.

touch *something handsome*. As to *tasting*, it is obviously to the proper management of this sense that we owe that infinite variety of delicacies which cover our genteel tables, and which have made *eating* give way, in a great measure, to mere *tasting*, most of the said delicacies being calculated for no other purpose. But the consideration of this subject would lead me into a vast and boundless field; and perhaps those ingenious authors, Mrs. Glasse and Mr. Farley,* are better qualified to enter upon it. In the mean time I remain, sir, your humble servant,

ORGANICUS.

P. S. I have omitted to mention *common sense* in my letter, but it has been so long in disuse that I did not think it necessary; and it is perhaps the disuse of it, which has left us so much room and time for the improvement of the other senses.

For Dr. Anderson's Recreations.

ADDITIONAL OBSERVATIONS ON SLUGS.

SIR,

FLATTERED by the obliging notice you were so kind as to take of the few inquiries I made respecting slugs (page 155) I am thereby emboldened to offer a few farther suggestions on the same subject that have since occurred to me in consequence of a continued attention to it.

I immediately applied the remedy you suggested for getting rid of that insect; nor can I persuade myself but their numbers must be considerably diminished in

* Authors of Treatises on Cookery.

time in consequence of the immense multitudes that are thereby destroyed; for I am convinced that I myself did not kill less than a thousand every day during several weeks that the weather continued rainy after the publication of your Fourteenth Number, though I am forced to confess that their numbers seemed not to be much abated during the continuance of the wet weather; for they continued to appear in succession in vast multitudes day after day on the same spot where I continued to pick them clean up, once at least, sometimes twice a day; but no sooner did the dry weather set in than they wholly disappeared, and it is now at least eight weeks since I have been able to perceive one, or the marks of one of them upon any vegetable in my garden. In short, I am made to understand that slugs never are seen at any season during a continuance of dry weather, unless in damp or shady places, which as effectually makes them disappear, as a frosty day does that of butterflies.

This being a fact universally admitted, I now wish to know what becomes of them during the continuance of dry weather; and I will be much obliged to you, sir, or any of your scientific correspondents, for any information you can give me on this curious subject. I would not have presumed to do this until I had made, myself, the most diligent search after them, but this has hitherto proved fruitless. I had laid down a quantity of decaying weeds in a corner by way of trap for destroying them, under which, during the rainy season, I never failed to find several hundreds of them crowded quite close upon each other within the space of ten or twelve hours after they had been thoroughly

cleared away. I chanced to be from home during the last week of the rainy season, so that none of them were then destroyed. On my return, which was a week after the dry weather had set in, I immediately lifted up the weeds, but not one was to be found; they had altogether disappeared. Having at that time many other objects soliciting my attention, and expecting that rain might perhaps be not at a great distance, I returned the weeds without making then any farther search; but some time afterwards, being curious to know what was become of them, I removed the weeds, opened up the ground beneath where they lay, and examined it with great care, but no vestige of them could there be found. The earth was then very dry; and I have examined the same spot repeatedly since with the like success.

I should have imagined that they had been wholly killed by the dry weather, even as tender insects are by the cold at the approach of winter, were it not that whenever rainy weather sets in the slugs make their appearance nearly in the same state they were in before they disappeared, that is to say, of many different sizes, and consequently of various ages; for the slug, when young, is of a very small size, and only attains great magnitude by age. Had the insects then been killed at the approach of dry weather, and those only which had been hatched from eggs appear at the return of wet, they must all have been of a small size; but, since this is not the case, we must suppose that the former have not been killed, but have only disappeared for a time, and now return. The question then still recurs, where have they been, and how have they been

supported in existence during the period they have been out of sight?

Revolving these questions often in my mind, I chanced to observe a phenomenon that seems to throw some light upon it, which I should not probably have remarked, had it not been from some hints you threw out in a former part of your work on the various modes adopted by supreme Wisdom for preserving animal existence. It is well known that the snail, like the slug, commits its ravages only during the continuance of moist weather; as they seldom are observed crawling about unless when the trees on which they chiefly delight to feed are moist either with rain or dew, in which state of the weather in a morning early they are seen stretched out at their whole length, and feeding greedily; but on the return of day, if they do not retire to their holes, they shrink into their shells and hide themselves among the thickest leaves, where they may be at that time frequently found at rest.

Having often remarked this procedure in rainy weather, and in rainy weather only, I was rather surprised of late at finding several snails at rest among the closest covert afforded by tufted leaves, or thick clusters of berries. At the first I imagined they were in the same state as during the day-time in rainy weather, being prepared to make their excursions during the night; but, not finding the traces of them as usual, and observing no marks of the fruit or the leaves being eaten about the place where they remained, I began to suspect that they were there fixed in a torpid state, and that they required little or no food during this warm

dry weather; and appearances, upon their being examined, strongly tended to confirm this conjecture. When taken into the hand they appeared to be much lighter than active snails of the same size usually are; and on looking in at the mouth of the shell, it appeared that their body had been greatly diminished, so that they did not nearly fill the shell; and some of them seemed to be so much shrivelled up as scarcely to be seen; neither did they, when thrown down, seem to make any active exertion to recover their former position. From all these circumstances it appears to me extremely probable, that the snail abstains totally from eating during the continuance of very hot and dry weather; that in consequence of this abstinence the body diminishes in size, and probably, if long enough continued, may be entirely desiccated, without discovering the smallest symptom of life, although, like the rotifere, and some other insects you have mentioned, it still retains the vital principle, which is called into activity by the application of moisture. I mention these things to you just now; because, if you shall have the goodness to insert it in your next number, it may come in time to enable some of your attentive readers to make observations upon it, and elucidate it by experiments better than I can do.

The slug is so nearly allied to the snail in its character and habits in other respects, that it seems natural to infer that it may resemble it in this respect also. Indeed the slug seems to be nothing else than a snail without a shell; and this very circumstance may account for the disappearance of the one, while the other still remains cognisable by the senses. The

shell of a snail, after it has been once formed, remains invariably of the fullest dimensions it ever had attained, so that it continues to be equally perceptible when the body of the insect that inhabits it is shrunk into a very small size, as when it was capable of filling up the whole cavity of the shell; not so with the slug, should its body shrink very much and become dry at the same time. Even when it is alive and soft it is not readily recognised by the eye among the earth in which it is imbedded; far less can it be cognisable by the senses when in its dry and shrivelled state. From these considerations, I am led to conjecture that this class of insects, like the Rotifere and Gordius, are endowed with the faculty of having their animal functions suspended without having the vital principle destroyed by the operation of drought, and that they may be revived and their bodies afterwards expanded to their former size by the influence of a due degree of moisture long enough continued under proper circumstances. I am far, however, from thinking that my observations have been made with such accuracy as to be sufficient to establish this position incontrovertibly; I only throw it out as a hint to attract the notice of such of your readers as have more leisure and better opportunities than myself to investigate this subject by means of accurate and well devised experiments. I even suspect that there are several other destructive classes of insects which are liable to have their animal functions for a time suspended by the influence of heat and drought, as others have been long known to be numbed though not killed by cold. I am, sir, your much obliged, and very humble servant.

A YOUNG INQUIRER.

*Notice concerning an improved Mode of constructing
Hot-houses.*

IN compliance with the request of several correspondents, I had resolved to give, in the course of the ensuing volume, complete directions for constructing hot-houses on an improved plan, and had given out the first paper on that subject for the next number of this work; but having showed it to a friend, in whose judgment I confide, he did not more approve of the matter of these essays than he disapproved of that mode of publication. "It is evidently," said he, "your intention and your wish that the public should be as speedily benefited by these illustrations as possible; but if you give them *freely* to the public, they will be disregarded: no one will pay the least attention to them, and many years may elapse before they come to be of any utility whatever, and it will be only after a long lapse of time, when some one shall have sense to avail himself of these hints, by doing what you yourself ought now to do, that is, obtaining a patent for the exclusive right of constructing them, that ever they will be applied to any beneficial use whatever." He then stated such a variety of cases illustrative of the truth of the position he had assumed, as rendered it impossible to deny that his opinion was well founded, concluding thus: "Depend upon it, that whatever costs men little or nothing, they account as of no importance; it is only what they obtain with difficulty, and at a high expence, that they ever account valuable, or give themselves any trouble to obtain the possession of."

Though it be impossible to controvert the first part of this argument, yet the last position appeared to me objectionable. It is not true that mankind, considered in the aggregate, value only that which is costly; on the contrary, the general wish is to obtain things as cheap as possible; but it is certain that, individually considered, many instances occur in which it is evident the expence of a thing constitutes its whole value. A fine jewel, for example, is prized merely because it elevates the possessor of it to a rank that few others can attain. A title and a coronet are prized for the same reason. While these objects are rare, they are, and ever must be, objects to which individuals will look up with an eager cupidity; make them common, they would no longer excite the same sensation. But it is not so with regard to the necessaries of life. Every one wishes to get his bread, and beer, and wine, so that the denomination and quality be not debased, as cheap as possible; and so of all other articles of common expence. A man may wish to have a hot-house, on the principle of being thus elevated to a certain rank; but he will naturally wish to have that hot-house as productive as possible, on the score of economy; and if one construction is known to be more perfect than another, he would also wish to be among the first who had that, for the sake of distinction also. If some other circumstance, then, did not counteract these sensations, men would be as ready to adopt improvements that are gratuitously offered as others. It is, however, undeniable that they are not; and that a patent introduces an useful invention into common notice ten times sooner than it otherwise would be:

nor is it difficult to perceive reasons which may satisfy us that this not only may, but ever must be the case, without infringing in any degree any of those principles that are well known to actuate the human mind.

I shall suppose, for example, that a very useful improvement is clearly described, and communicated gratis to the public. Many men who read that account are satisfied of its utility, and would be glad to purchase the object described were it brought within their reach; but if it is only *described* to them, and they are left to collect together all the materials necessary for constructing it, to find workmen, and oversee the execution of the whole, Is it to be expected that they should subject themselves to the trouble and expence that this must imply? No such thing. Before they can avail themselves of this invention, then, however much they may admire it, some one person, by following the particular manufacture in question as a business, must take the charge of all this upon himself, so that the person who wishes to obtain it has no farther care about it than merely to consider whether he is willing to part with the price at which it is charged in order to obtain the convenience it promises to afford. This reasoning is particularly applicable to the business of hot-houses, in the constructing of which various descriptions of workmen are to be employed, and materials of different kinds collected from different parts, which can only be done by a professional man. And when you come to think of choosing a professional man, Is it not natural to wish to be directed to a man who understands that business, and can be depended on to execute it pro-

perly? And how can this be so quickly or completely done in a new undertaking as by means of a patent, which, by making it strongly his interest to do it right, insures his attention, and attaches his responsibility?

From these considerations I am induced to think that it would be right to follow the advice of my friend, by applying for a patent; not with the most distant view of taking up that as a business myself; for this would be totally incompatible with my mode of life and objects of pursuit; but with a view to assign it over, upon liberal terms, to some active person of talents and respectability who may choose to follow as a business the constructing of hot-houses; to whom I shall give the most particular instructions as to every part. In the meanwhile, I think it proper to give the following general outlines of what will be effected by the improvements I have devised; intimating hereby, that I will be ready to receive proposals from any person whom it may suit, by letters, post paid, addressed to me, to the care of the publisher of this work, which shall be duly attended to, and punctually answered; it being always understood that none but principals who can bring the most undoubted references in regard to talents and respectability of character will be treated with, and that upon a disclosure of particulars they shall be fully satisfied that every thing that is mentioned below will be undeniably effected. If there be any doubt remaining in their mind on that head after the disclosure is made, all previous agreements shall be void, and they shall be perfectly free.

To begin with houses that require the lowest degrees of heat, that of the vinery and green-house, where the

grapes are not intended to ripen earlier than from the middle of June to July, as the season may be sunny, or the reverse, no sort of artificial heat whatever will be required; the whole will be effected by the natural heat of the sun alone; so that no expence whatever for fuel will in this case be required.

Where the grapes are wished to be forced more early in the season, some artificial heat will be wanted, more or less, according to the degree of forcing required; but in nineteen cases out of twenty, where the house is to be new built, the heat wanted, whatever that shall be, can be obtained without the smallest expence for fuel on that account; and in the most unfavourable situation that can be devised, the quantity of fuel required for that purpose will not amount to *one tenth* part of that which is necessarily required for producing a similar effect in a common vinery. For example:

In a vinery thus constructed, which, under ordinary management, shall produce on an average of years at least *ten thousand* full sized bunches of grapes, the latest of which may be gathered in the month of May; and which may besides bring to perfection, if it be wished, at least fifteen hundred pots of forced strawberries, or other plants equivalent to these, the whole consumption of fuel shall not exceed at the rate of one half London chaldron of coals.

In respect to the stove, the expence of bark will in all cases be saved, this article being not only unnecessary under the improved mode of construction, but in all cases it would be, as in times past, highly pernicious. An article this however, which, though ex-

tremely destructive, could by no means be dispensed with under the present mode of construction; unless by the modern invention of the use of steam, which, in as far as it operates in supplying the place of hot tan, is also an unnecessary and superfluous expence. In the stove also, as in the vinery, if the houses are to be built new, the artificial heat necessary may in most cases be obtained without any expence of fuel; and in the worst cases an equal proportion of fuel will be saved, as is above stated respecting the vinery.

But the improvements proposed are not confined to the mere saving of expence in fuel, they extend also to the removing of diseases, the improving the health, augmenting the vigour of the plants in the houses, simplifying the whole process of management, and diminishing the risks that originate in the carelessness of the manager. Matters are here so arranged as to admit of the stove even to be left to itself for a considerable length of time without the risk of any disagreeable event taking place; and that destructive disease known by the name of *damp*, under which almost every plant thus reared now perpetually languishes, and so many of the most valuable kinds die, in spite of every care that can be bestowed upon them, will be completely obviated; and the insects, if not entirely removed, greatly diminished, so that not only will the profits to be derived from such houses be much augmented, but the pleasure also that may be derived from them greatly heightened. A complete ventilation in these houses may be obtained at pleasure, to any degree that shall be judged expedient, either accompanied with a diminution of the heat, or with-

out any such diminution, as circumstances shall indicate.

For effecting these purposes, the devices are so simple as to run little risk of having any parts of the apparatus put out of order, and the original expence of constructing the houses will be less than those in use at present; besides, glass of any kind that may be on hand at present may be so modified as to admit of being converted to the uses here mentioned with very trifling expence.

I am aware that by merely stating these particulars without explanations, I run the risk of being accounted a visionary; but the time is not, I trust, at a great distance when I shall have an opportunity of removing that stigma by a full and distinct explanation of particulars; for I have little doubt but such arrangements may be made as to admit of this being done in the course of the next (the fourth) volume of this work. It is hoped my correspondents will accept of this as a sufficient apology for this small delay.

To the Readers of this Work.

THE Editor cannot conclude this volume without tendering his most sincere thanks for the candid indulgence with which his readers have received the humble and imperfect efforts that he has made for their gratification; an indulgence that has impressed his mind with sensations which words are too feeble to express—a liberality on their part which imposed upon him claims that he considered as irresistible, to perform, with the utmost punctuality possible, every part of the contract that he had engaged in for the accommodation of his readers.

With these sensations operating upon his mind, he has felt himself exposed, during the progress of this volume, to a series of mortifications that have proved highly distressing to him. Owing to the misapprehension of parties, or other circumstances, he was astonished to find, upon receiving the thirteenth number, (which he did not see till it was all printed off) that it had been printed upon a paper so much thinner than that which had been formerly used. He went to town immediately, and gave the most positive orders to get paper of the former qua-

tilly, without regard to expence, strictly charging the printer not to work a sheet on paper of an inferior quality; yet inferior paper has still been used. No less than three times in the course of this volume has the same practice been repeated; and it was not till he at last gave orders to have paper made on purpose, to be at all times in readiness, of the same quality, that he could have any certainty of having this matter duly adjusted: that paper is now in the printing-office for the next volume; the last half sheet of this number, as well as the index (being one sheet more than the regular quantity), has been worked upon that paper: and he has received the most positive assurances, that in future no circumstance of this unpleasant nature shall again take place.

The Editor has experienced also a similar kind of vexation respecting engravings. Though he came under no positive engagement with his readers on this head, yet it was his wish and his intention to give figures well engraved, wherever the subject should require it: but in this respect he has been repeatedly disappointed. For want of a possibility of getting the engravings executed at the time he wished, he has been frequently obliged to set aside essays that were intended for insertion, and to substitute others in their stead; or to publish the former without the illustrations that he had prepared. At the present moment an essay is lying in the printing-office, the types of which have been set up for more than four months, for want of an illustrative figure that should accompany it; and another, a communication from an ingenious correspondent on a particular mode of constructing drains, has been lying in the printer's hands many months, for the want of an illustrative diagram. Thus has this work been made to assume a niggardly appearance highly unworthy the character of a gentleman on any occasion to countenance; and under the relation that the Editor stands in to his readers, superlatively disgraceful to him.

These circumstances operated so strongly on his mind, and gave him so much disquietude, that he had determined at one time to stop the publication entirely at the close of the present volume; for, instead of a pleasing recreation to him, as the work would otherwise be, it became a task of the most distressing kind: but the respect that he owes to his readers overcame that hasty resolution. He recollected, that several subjects were begun which could not be finished in this volume; and that it would be an ill return for their indulgence to him, to leave them with an imperfect work. From this consideration chiefly, he relinquished that idea. Should he again experience a failure in these particulars, he will on no account subject himself to a series of such vexations, and will quietly desist; but his readers may rest assured, that if this event should happen, he will take care to finish the subjects that shall have been commenced, so that they may be left in possession of a work complete at least as far as it goes. It is his wish to visit the Netherlands, should a peace take a place, in order to make himself fully acquainted with the rural economy of that country; in which case he fears he shall be obliged to suspend his publication, not daring to rely on the regularity of others: but this he will not do in an abrupt manner.

END OF THE THIRD VOLUME.

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E R R A T A.

Page 61, line 5, for "obscurios," read "obscurius."
 155, after line second there ought to be a break.
 317, for "che cogliese!" read "che coglione"—*Anglice*, "what a simpleton, what a fool!"
 353, line 8 from the bottom, for "recommended," read "recommend."
 463, line 19, 24, in a few of the copies, for "*rangiferou*," read "*rangiferus*."

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